

HP XP P9500 Owner Guide

Abstract

This guide describes the operation of the HP XP P9500 disk array. Topics include a description of the disk array hardware, instructions on how to manage the disk array, descriptions of the disk array control panel and LED indicators, troubleshooting, and regulatory statements. The intended audience is a storage system administrator or authorized service provider with independent knowledge of the HP XP P9500 disk array and the HP Remote Web Console.



© Copyright 2010, 2014 Hewlett-Packard Development Company, L.P.

The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Acknowledgements

Microsoft®, Windows®, Windows® XP, and Windows NT® are U.S. registered trademarks of Microsoft Corporation.

Java and Oracle are registered trademarks of Oracle and/or its affiliates.

Export Requirements

You may not export or re-export this document or any copy or adaptation in violation of export laws or regulations.

Without limiting the foregoing, this document may not be exported, re-exported, transferred or downloaded to or within (or to a national resident of) countries under U.S. economic embargo, including Cuba, Iran, North Korea, Sudan, and Syria. This list is subject to change.

This document may not be exported, re-exported, transferred, or downloaded to persons or entities listed on the U.S. Department of Commerce Denied Persons List, Entity List of proliferation concern or on any U.S. Treasury Department Designated Nationals exclusion list, or to parties directly or indirectly involved in the development or production of nuclear, chemical, biological weapons, or in missile technology programs as specified in the U.S. Export Administration Regulations (15 CFR 744).

Warranty

WARRANTY STATEMENT: To obtain a copy of the warranty for this product, see the warranty information website:

<http://www.hp.com/go/storagewarranty>

Contents

| | | |
|----------|---|-----------|
| 1 | Introduction..... | 6 |
| | P9500 overview..... | 6 |
| | Hardware overview..... | 6 |
| | Controller chassis..... | 7 |
| | Drive chassis..... | 8 |
| | Features..... | 9 |
| | Scalability..... | 9 |
| | High performance..... | 10 |
| | High capacity..... | 10 |
| | Connectivity..... | 11 |
| | P9500..... | 11 |
| | Remote Web Console..... | 11 |
| | High reliability..... | 11 |
| | Non disruptive service and upgrades..... | 11 |
| | Economical and quiet..... | 11 |
| | Specifications..... | 12 |
| | Software features and functions..... | 13 |
| 2 | Functional and operational characteristics..... | 17 |
| | System architecture overview..... | 17 |
| | Hardware architecture..... | 17 |
| | RAID implementation overview..... | 17 |
| | Array groups and RAID levels..... | 17 |
| | Sequential data striping..... | 19 |
| | LDEV striping across array groups..... | 19 |
| | CU Images, LVIs, and Logical Units..... | 20 |
| | CU images..... | 20 |
| | Logical Volume images..... | 21 |
| | Logical Units..... | 21 |
| | Mainframe operations..... | 21 |
| | Mainframe compatibility and functionality..... | 21 |
| | Mainframe operating system support..... | 22 |
| | Mainframe configuration..... | 22 |
| | System option modes, host modes, and host mode options..... | 22 |
| | System option modes..... | 22 |
| | Host modes and host mode options..... | 51 |
| | Open systems operations..... | 51 |
| | Open systems compatibility and functionality..... | 52 |
| | Open systems host platform support..... | 52 |
| | Open systems configuration..... | 52 |
| | Remote Web Console..... | 53 |
| 3 | System components..... | 54 |
| | Controller chassis..... | 54 |
| | System control panel..... | 56 |
| | Drive chassis..... | 57 |
| | Cache memory..... | 59 |
| | Memory operation..... | 60 |
| | Data protection..... | 60 |
| | Shared memory..... | 61 |
| | Flash storage chassis..... | 61 |
| | P9000 flash module..... | 61 |

| | |
|--|-----------|
| Flash module unit..... | 62 |
| Flash storage chassis..... | 63 |
| Cache memory..... | 64 |
| System capacities with smart flash modules..... | 64 |
| 4 Power On/Off procedures..... | 66 |
| Safety and environmental information..... | 66 |
| Standby mode..... | 66 |
| Power On/Off procedures..... | 66 |
| Power On procedures..... | 66 |
| Power Off procedures..... | 67 |
| Battery backup operations..... | 67 |
| Cache destage batteries..... | 68 |
| Battery life | 68 |
| Long term array storage..... | 68 |
| 5 Troubleshooting..... | 70 |
| Solving problems..... | 70 |
| Service information messages..... | 70 |
| C-Track..... | 71 |
| Insight Remote Support..... | 71 |
| Failure detection and reporting process..... | 72 |
| 6 Support and other resources..... | 74 |
| Contacting HP..... | 74 |
| Subscription service..... | 74 |
| Documentation feedback..... | 74 |
| Related information..... | 74 |
| HP websites..... | 74 |
| Conventions for storage capacity values..... | 75 |
| Typographic conventions..... | 75 |
| Rack stability..... | 76 |
| A Comparing the XP24000/XP20000 Disk Array and P9500 | 77 |
| Comparison of the XP24000/XP20000 Disk Array and P9500..... | 77 |
| B Specifications..... | 80 |
| Mechanical specifications..... | 80 |
| Electrical specifications..... | 80 |
| System heat and power specifications..... | 80 |
| System components heat and power specifications | 81 |
| AC power - PDU options..... | 82 |
| Environmental specifications..... | 83 |
| C Regulatory compliance notices..... | 85 |
| Regulatory compliance identification numbers..... | 85 |
| Federal Communications Commission notice..... | 85 |
| FCC rating label..... | 85 |
| Class A equipment..... | 85 |
| Class B equipment..... | 85 |
| Declaration of Conformity for products marked with the FCC logo, United States only..... | 86 |
| Modification..... | 86 |
| Cables..... | 86 |
| Canadian notice (Avis Canadien)..... | 86 |
| Class A equipment..... | 86 |
| Class B equipment..... | 86 |
| European Union notice..... | 86 |
| Japanese notices..... | 87 |

| | |
|---------------------------------------|----|
| Japanese VCCI-A notice..... | 87 |
| Japanese VCCI-B notice..... | 87 |
| Japanese VCCI marking..... | 87 |
| Japanese power cord statement..... | 87 |
| Korean notices..... | 87 |
| Class A equipment..... | 87 |
| Class B equipment..... | 88 |
| Taiwanese notices..... | 88 |
| BSMI Class A notice..... | 88 |
| Taiwan battery recycle statement..... | 88 |
| Turkish recycling notice..... | 88 |
| Laser compliance notices..... | 89 |
| English laser notice..... | 89 |
| Dutch laser notice..... | 89 |
| French laser notice..... | 89 |
| German laser notice..... | 90 |
| Italian laser notice..... | 90 |
| Japanese laser notice..... | 90 |
| Spanish laser notice..... | 91 |
| Recycling notices..... | 91 |
| English recycling notice..... | 91 |
| Bulgarian recycling notice..... | 92 |
| Czech recycling notice..... | 92 |
| Danish recycling notice..... | 92 |
| Dutch recycling notice..... | 92 |
| Estonian recycling notice..... | 93 |
| Finnish recycling notice..... | 93 |
| French recycling notice..... | 93 |
| German recycling notice..... | 93 |
| Greek recycling notice..... | 94 |
| Hungarian recycling notice..... | 94 |
| Italian recycling notice..... | 94 |
| Latvian recycling notice..... | 94 |
| Lithuanian recycling notice..... | 95 |
| Polish recycling notice..... | 95 |
| Portuguese recycling notice..... | 95 |
| Romanian recycling notice..... | 95 |
| Slovak recycling notice..... | 96 |
| Spanish recycling notice..... | 96 |
| Swedish recycling notice..... | 96 |
| Battery replacement notices..... | 96 |
| Dutch battery notice..... | 96 |
| French battery notice..... | 97 |
| German battery notice..... | 97 |
| Italian battery notice..... | 98 |
| Japanese battery notice..... | 98 |
| Spanish battery notice..... | 99 |

| | |
|---------------|-----|
| Glossary..... | 100 |
|---------------|-----|

| | |
|------------|-----|
| Index..... | 103 |
|------------|-----|

1 Introduction

P9500 overview

The P9500 is a high capacity, high performance disk array that offers a wide range of storage and data services, software, logical partitioning, and simplified and unified data replication across heterogeneous disk arrays. Its large scale, enterprise class virtualization layer combined with Smart Tiers and Thin Provisioning software, delivers virtualization of internal and external storage into one pool.

Using this system, you can deploy applications within a new framework, leverage and add value to current investments, and more closely align IT with business objectives. P9500 disk arrays provide the foundation for matching application requirements to different classes of storage and deliver critical services including:

- Business continuity services
- Content management services (search, indexing)
- Non disruptive data migration
- Thin Provisioning
- Smart Tiers
- High availability
- Security services
- I/O load balancing
- Data classification
- File management services

New technological advances improve reliability, serviceability and access to disk drives and other components when maintenance is needed. Each component contains a set of LEDs that indicate the operational status of the component. The system includes new and upgraded software features, including Smart Tiers, and a significantly improved, task oriented version of Remote Web Console that is designed for ease of use and includes context sensitive online help. The system documentation has been changed to a task oriented format that is designed to help you find information quickly and complete tasks easily.

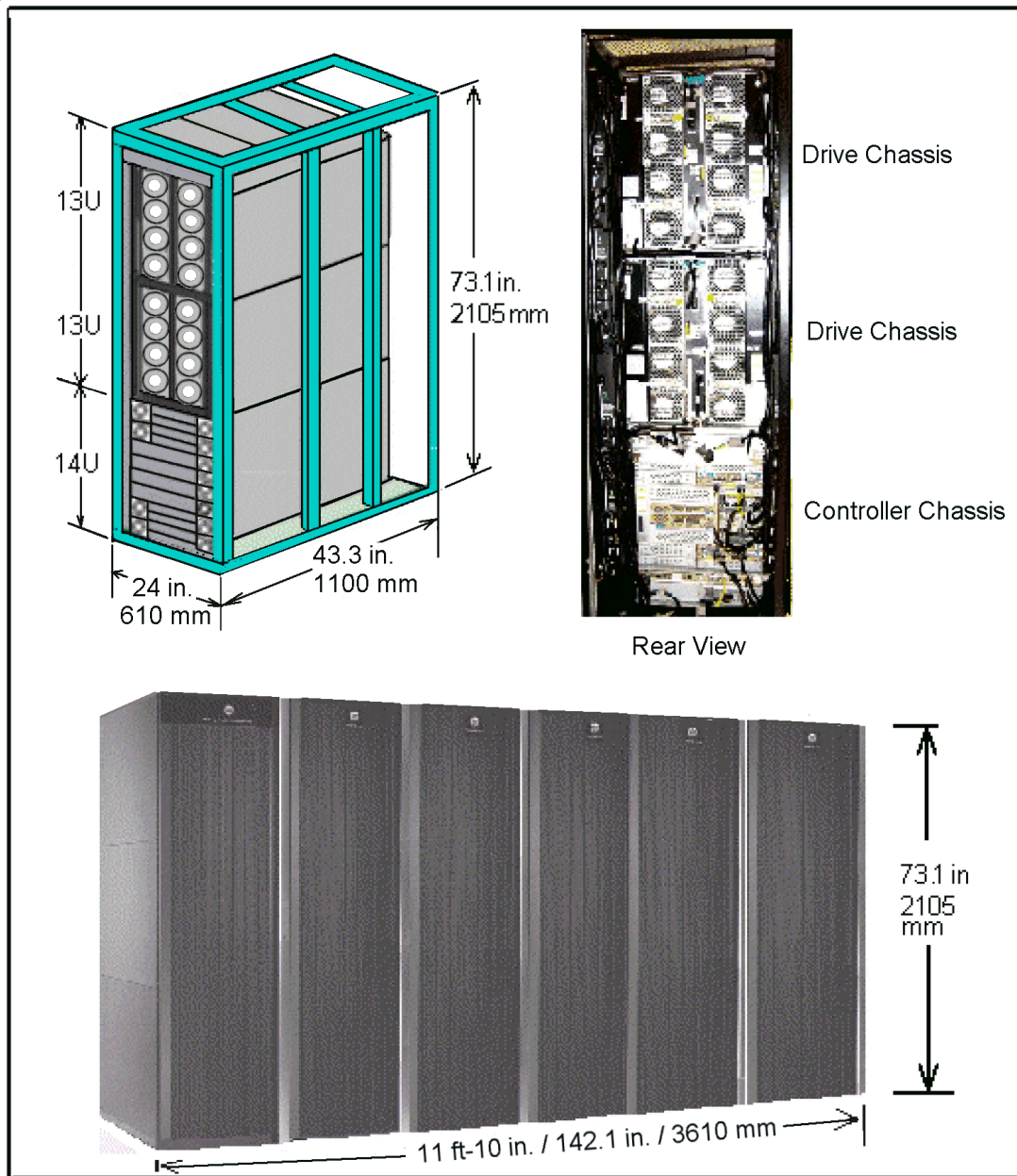
Hardware overview

The P9500 disk arrays contain significant new technology that was not available in previous HP disk arrays. The system can be configured in many ways, starting with a small (one rack) to a large (six rack) system that includes two controller chassis, up to 2048 HDD drives which include up to 256 solid state drives, and a total of 1024 GB cache. The system provides a highly granular upgrade path, allowing the addition of disk drives to the drive chassis, and Processors Blades and other components to the controller chassis in an existing system as storage needs increase. The controller chassis (or DKU) of the P9500 disk array can be combined so that what would previously have been two separate disk arrays are now a single disk array with homogeneous logic control, cache, and front end and back end interfaces, all mounted in custom HP 19 inch racks.

A basic P9500 disk array is a control rack (Rack- 00) that contains a controller chassis and two drive chassis (factory designation DKU). The fully configured P9500 disk array consists of two controller chassis and sixteen drive chassis for fully configured system. The controller chassis contains the control logic, processors, memory, and interfaces to the drive chassis and the host servers. A drive chassis consists of disks or SSD drives, power supplies, and the interface circuitry connecting it to the controller chassis. The remaining racks (Rack-01, Rack-02, Rack-10 and Rack-11) contain from one to three drive chassis.

The following sections provide descriptions and illustrations of the P9500 disk array and its components.

Figure 1 P9500 disk array



NOTE: Each Rack is 600mm wide without side covers. Add 5mm to each end of entire assembly for each side cover.

Controller chassis

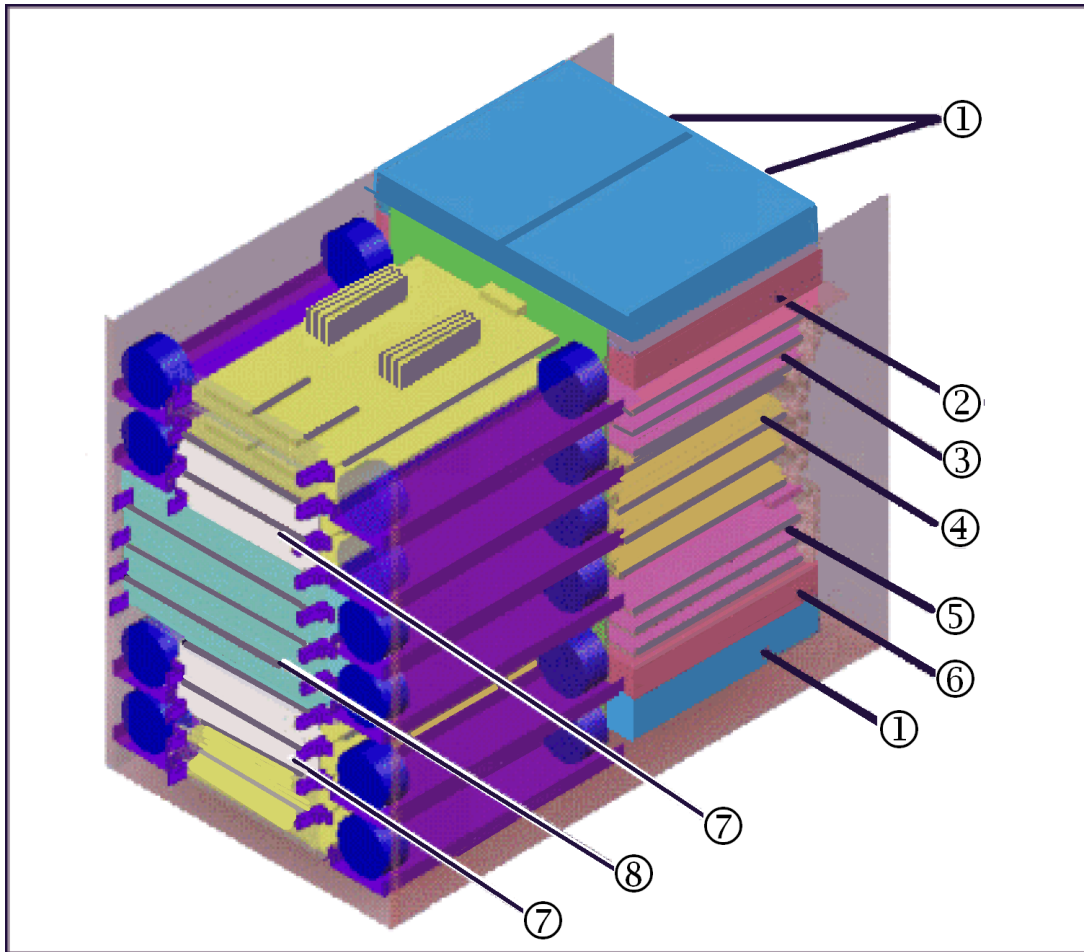
The controller chassis (factory designation DKC) includes the logical components, memory, disk drive interfaces, and host interfaces. It can be expanded with a high degree of granularity to a system offering up to twice the number of processors, cache capacity, host interfaces and disk storage capacity.

The controller chassis includes the following maximum number of components: two service processors, 512 GB cache memory, four grid switches, four redundant power supplies, eight channel adapters, four disk adapters, and ten dual fan assemblies. It is mounted at the bottom of

the rack because it is the heavier of the two units. If a system has two SVPs, both SVPs are mounted in controller chassis #0.

The following illustration shows the locations of the components in the controller chassis. The controller chassis is described in more detail in [“System components” \(page 54\)](#).

Figure 2 Controller chassis

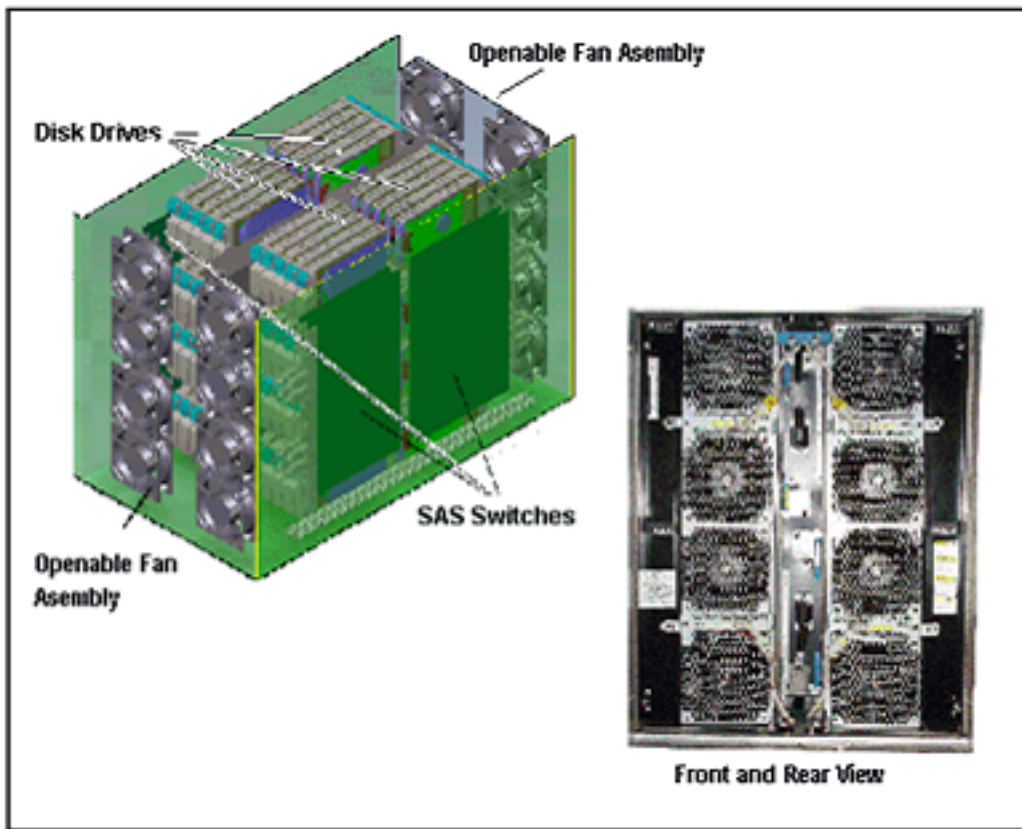


| Item | Description |
|------|--|
| 1 | AC/DC: Power Supply 2 or 4 per controller |
| 2 | Service Processor: One or two units in the #0 controller chassis |
| 3 | CHA |
| 4 | Grid switches |
| 5 | CHA (up to 7) and DKA (up to 4) |
| 6 | Service Processor: One or two units in the #0 controller chassis |
| 7 | Cache: 2 to 8 cache boards in pairs (2, 4, 6, 8) |
| 8 | P9500: 2 to 4 microprocessor boards |

Drive chassis

The drive chassis (factory designation DKU) consists of SAS switches, slots for 2 1/2 inch HDD or SSD drives, and four 4 fan door assemblies that can be easily opened to allow access to the drives. Each drive chassis can hold 128 2 1/2 inch HDD or SSD drives. The maximum number of 2 1/2 inch drives in a P9500 system is 2048.

Figure 3 Disk Unit



Features

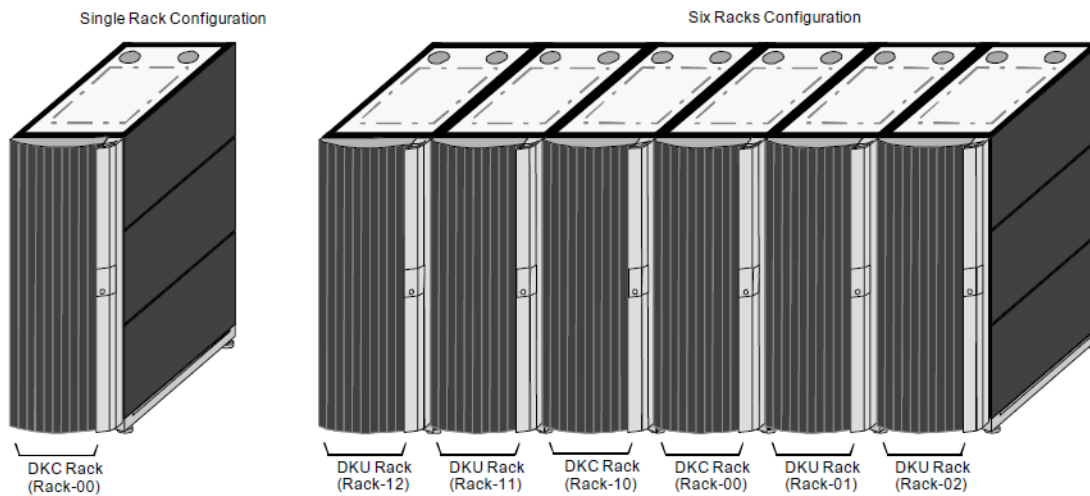
This section describes the main features of the P9500 disk array.

Scalability

The P9500 disk array is highly scalable and can be configured in several ways as needed to meet customer requirements:

- The minimum configuration is a single rack containing one controller chassis and two drive chassis.
- One to three racks containing one controller chassis and up to eight drive chassis. A drive chassis can contain up to 128 2 1/2 disk drives or 128 SSDs. Drives can be intermixed. See [Table 2 \(page 13\)](#) for details.
- The **maximum configuration** is a six rack twin version of the above that contains two controller chassis and up to 16 drive chassis containing up to 2048 2 1/2 inch disk drives. The total internal raw physical storage space of this configuration is approximately 2458 TB (based on 1.2 TB HDDs).

Figure 4 Example P9500 disk array configurations



In addition to the number of disk drives, the system can be configured with disk drives of different capacities and speeds, varying numbers of CHAs and DKAs, and varying cache capacities, as follows:

- Two to six CHAs (each is a pair of boards). This provides a total of 12 when all of the CHA slots are used and there are no DKAs installed, as in a diskless system. The maximum total number of CHAs and DKAs is 12.
- Two to four DKAs (each is a pair of boards). This provides a total of 8 when all of the DKA slots are used. When all 4 DKA pairs are installed, then up to 8 CHA pairs can be installed
- Cache memory capacity: 256 GB (1 module / 3-rack system) and 512 GB (two modules / 6-rack system)
- Disk drive capacities of 146 GB, 200 GB (SSD), 300 GB, 400 GB (SSD), 500 GB, 600 GB, 800 GB (SSD), 900 GB, and 1.2 TB.
- Channel ports: 80 for one module, 176 for two modules.

High performance

The P9500 includes several new features that improve the performance over previous models. These include:

- 8 GBps only Fibre Channel for CHAs without the limitation of microprocessors on each board.
- SSD flash drives with ultra high speed response.
- High speed data transfer between the DKA and HDDs at a rate of 6 GBps with the SAS interface.
- High speed quad core CPUs that provide three times the performance of an XP24000/XP20000 Disk Array.

High capacity

The P9500 supports the following high capacity features:

- HDD (disk) drives with capacities of 146 GB, 300 GB, 500 GB, 600 GB, 900 GB, and 1.2 TB. See [Table 2 \(page 13\)](#).
- SSD (flash) drives with capacity of 200 GB, 400 GB, and 800 GB. See [Table 2 \(page 13\)](#).
- Controls up to 65,280 logical volumes and up to 2,048 disk drives, and provides a maximum raw physical disk capacity of approximately 1229 TB using 1.2 TB drives.

Connectivity

P9500

The P9500 Disk Array supports most major IBM Mainframe operating systems and Open System operating systems, such as Microsoft Windows, Oracle Solaris, IBM AIX, Linux, HP-UX, and VMware. For more complete information on the supported operating systems, contact HP Technical Support.

P9500 supports the following host interfaces. They can mix within the disk array.

- Mainframe: Fibre Channel (FICON)
- Open system: Fibre Channel

Remote Web Console

The required features for the Remote Web Console computer include operating system, available disk space, screen resolution, CD drive, network connection, USB port, CPU, memory, browser, Flash, and Java environment. These features are described in Chapter 1 of the *HP XP P9000 Remote Web Console User Guide*.

High reliability

The P9500 disk array includes the following features that make the system extremely reliable:

- Support for RAID6 (6D+2P), RAID5 (3D+1P/7D+1P), and RAID1 (2D+2D/4D+4D) See [“Functional and operational characteristics” \(page 17\)](#) for more information on RAID levels.
- All main system components are configured in redundant pairs. If one of the components in a pair fails, the other component performs the function alone until the failed component is replaced. Meanwhile, the disk array continues normal operation.
- The P9500 is designed so that it cannot lose data or configuration information if the power fails. This is explained in [“Battery backup operations” \(page 67\)](#).

Non disruptive service and upgrades

The P9500 disk array is designed so that service and upgrades can be performed without interrupting normal operations. These features include:

- Main components can be “hot swapped” — added, removed, and replaced without any disruption — while the disk array is in operation. The front and rear fan assemblies can be moved out of the way to enable access to disk drives and other components, but not both at the same time. There is no time limit on changing disk drives because either the front or rear fans cool the unit while the other fan assembly is turned off and moved out of the way.
- A Service Processor mounted on the controller chassis monitors the running condition of the disk array. Connecting the SVP with a service center enables remote maintenance.
- The firmware (microcode) can be upgraded without disrupting the operation of the disk array. The firmware is stored in shared memory (part of the cache memory module) and transferred in a batch, reducing the number of transfers from the SVP to the controller chassis via the LAN. This increases the speed of replacing the firmware online because it works with two or more processors at the same time.
- The P9500 is designed so that it cannot lose data or configuration information if the power fails (see [“Battery backup operations” \(page 67\)](#)).

Economical and quiet

The three speed fans in the control and drive chassis are thermostatically controlled. Sensors in the units measure the temperature of the exhaust air and set the speed of the fans only as high as necessary to maintain the unit temperature within a preset range. When the system is not busy and

generates less heat, the fan speed is reduced, saving energy and reducing the noise level of the system.

When the disk array is in standby mode, the disk drives spin down and the controller and drive chassis use significantly less power. For example, a system that consumes 100 amps during normal operation, uses only 70 amps while in standby mode.

Specifications

The following tables provide general specifications of the P9500. Additional specifications are located in “Specifications” (page 80).

Table 1 P9500 specifications

| Item | Size | Single Module | Dual Module |
|---|--|--|---|
| Maximum raw drive capacity (based on 1.2 TB HDDs) | Internal | 1229 TB | 2458 TB |
| | External | 247 PB | 247 PB |
| Maximum number of volumes | - | 64k | 64k |
| Supported drives | See Table 2 (page 13) . | | |
| Cache memory capacity | . | Min 64 GB Max 512 GB | Min 128 GB Max 1024 GB |
| Cache flash memory capacity | . | Min 64 GB Max 1028 GB | |
| RAID Level | . | RAID1, RAID5, RAID6 | |
| RAID Group Configuration | RAID1 | 2D+2D, 4D+4D | |
| | RAID5 | 3D+1P, 7D+1P | |
| | RAID6 | 6D+2P | |
| Internal Path | Architecture | Hierarchical Star Net | |
| | Maximum Bandwidth | Cache Path = 128 GB/s Control Path = 64 GB/s | |
| Back-end Path | SAS 6G | 32 (2WL*6) | 64 (2WL*32) |
| Number of ports per installation unit | FC 2/4/8G | 80 /16,8 | 160/16,8 |
| Device I/F | Controller chassis drive chassis Interface | SAS/Dual Port | |
| | Data transfer rate | Max. 6 GBps | |
| | Maximum number of HDD per SAS I/F | 256 (2.5 inch HDD) | |
| | Maximum number of CHAs | 4 if drives installed 6 if diskless | 8 if drives installed 12 if diskless |
| Channel I/F | Mainframe | 1/2/4 GBps Fibre Channel: 16MFS/16MFL 2/4/8 GBps Fibre Channel: 16MUS/16MUL | |
| | Open systems | 2/4/8 GBps Fibre Shortwave: | |

Table 1 P9500 specifications *(continued)*

| Item | Size | Single Module | Dual Module |
|--|---------------|----------------|----------------|
| | | 8UFC/16UFC | |
| Management Processor Cores | Quantity | 16 cores | 32 cores |
| Micro Processor Blade configuration Minimum/maximum | CHAs | 6 ¹ | 6 ¹ |
| | DKAs | 0 or 2 / 42 | 2 / 8 |
| | Cache | 2 / 8 | 2 / 16 |
| | Switches /CSW | 2 / 4 | 4 / 8 |
| Notes: | | | |
| 1. All CHA configuration, no DKAs (diskless system). | | | |

Table 2 Drive specifications

| Drive Type | Size | Drive Capacity | Speed (RPM) |
|---|------------------|----------------------------------|--------------------------------|
| HDD (SAS) | 2 1/2 inch | 300 GB | 15,000 |
| | | 300, 600, and 900 GB | 10,000 |
| | | 500 GB, 1 TB, and 1.2 TB | 7,200 |
| SSD (Flash) | 2 1/2 inch | 200, 400, and 800 GB | n/a |
| Drive Type | Drive Chassis | Single Module (3 rack system) | Dual Module (6 rack system) |
| HDD, 2 1/2 inch | 128 | 1024 | 2048 |
| SSD (Flash) | 128 ¹ | 128 ² | 256 ² |
| Notes: | | | |
| 1. SSD drives can be mounted all in one drive chassis or spread out among all of the chassis in the storage system. | | | |
| 2. Recommended maximum number. | | | |

The drives must be added four at a time to create RAID groups, unless they are spare drives.

Software features and functions

The P9500 disk array provides advanced software features and functions that increase data accessibility and deliver enterprise wide coverage of online data copy/relocation, data access/protection, and storage resource management. HP software products and solutions provide a full set of industry leading copy, availability, resource management, and exchange software to support business continuity, database backup and restore, application testing, and data mining. The following tables describe the software that is available on the P9500 disk array.

Table 3 Virtualization features and functions

| Feature | Description |
|-----------------|---|
| Cache Partition | Provides logical partitioning of the cache which allows you to divide the cache into multiple virtual cache memories to reduce I/O contention. |
| Cache Residency | Supports the virtualization of external disk arrays. Users can connect other disk arrays to the P9500 disk array and access the data on the external disk array via virtual devices created on the P9500 disk array. Functions such as Continuous Access Synchronous and Cache Residency can be performed on external data through the virtual devices. |

Table 4 Performance management features and functions

| Feature | Description |
|-------------------------|--|
| Cache Residency | Cache Residency locks and unlocks data into the cache to optimize access to the most frequently used data. It makes data from specific logical units resident in a cache, making all data accesses become cache hits. When the function is applied to a logic unit, frequently accessed, throughput increases because all reads become cache hits. |
| Performance Monitor | Performs detailed monitoring of the disk array and volume activity. This is a short term function and does not provide historical data. |
| Parallel Access Volumes | Enables the mainframe host to issue multiple I/O requests in parallel to the same LDEV/UCB/device address in the P9500. Parallel Access Volumes provides compatibility with the IBM Workload Manager (WLM) host software function and supports both static and dynamic PAV functionality. |

Table 5 Provisioning features and functions for Open systems

| Feature | Description |
|-------------------|--|
| Smart Tiers | Provides automated movement of sub LUN data for a multi tiered Thin Provisioning pool. The most accessed pages within the pool is dynamically relocated onto a faster tier in the pool. This improves performance of the most frequently accessed pages while giving the remaining data sufficient response times on a lower cost storage. |
| LUN Manager | The LUN Manager feature configures the fibre channel ports and devices (logical units) for operational environments. |
| LUN Expansion | The LUN Expansion feature expands the size of a logical unit (volume) to which an open system host computer accesses by combining multiple logical units (volumes) internally. |
| Thin Provisioning | The Thin Provisioning feature virtualizes some or all of the system's physical storage. This simplifies administration and addition of storage, eliminates application service interruptions, and reduces costs. It also improves the capacity and efficiency of disk drives by assigning physical capacity on demand at the time of the write command receipt without assigning the physical capacity to logical units. |
| Virtual LVI | Converts single volumes (logical volume images or logical units) into multiple smaller volumes to improve data access performance. |
| Data Retention | Protects data in logical units / volumes / LDEVs from I/O operations illegally performed by host systems. Users can assign an access attribute to each volume to restrict read and/or write operations, preventing unauthorized access to data. |

Table 6 Provisioning features and functions for Mainframe

| Feature | Description |
|-------------------------------|---|
| Virtual LVI | Converts single volumes (logical volume images or logical units) into multiple smaller volumes to improve data access performance. |
| Volume Security for Mainframe | Restricts host access to data on the P9500. Open system users can restrict host access to LUNs based on the host's world wide name (WWN). Mainframe users can restrict host access to volumes based on node IDs and logical partition (LPAR) numbers. |
| Volume Retention | Protects data from I/O operations performed by hosts. Users can assign an access attribute to each logical volume to restrict read and/or write operations, preventing unauthorized access to data. |

Table 7 Data replication features and functions

| Feature | Description |
|-----------------------------------|---|
| Continuous Access Synchronous and | Performs remote copy operations between disk arrays at different locations. Continuous Access Synchronous provides the synchronous copy mode for open |

Table 7 Data replication features and functions *(continued)*

| Feature | Description |
|---|--|
| Continuous Access Synchronous Z | systems. Continuous Access Synchronous Z provides synchronous copy for mainframe systems. |
| Business Copy and Business Copy Z | Creates internal copies of volumes for purposes such as application testing and offline backup. Can be used in conjunction with True Copy or Continuous Access Journal to maintain multiple copies of data at primary and secondary sites. |
| Snapshot (open systems only) | Snapshot creates a virtual, point-in-time copy of a data volume. Since only changed data blocks are stored in the Snapshot storage pool, storage capacity is substantially less than the source volume. This results in significant savings compared with full cloning methods. With Snapshot, you create virtual copies of a data volume in the Virtual Storage Platform |
| Continuous Access Journal and Continuous Access Journal Z | This feature provides a RAID storage based hardware solution for disaster recovery which enables fast and accurate system recovery, particularly for large amounts of data which span multiple volumes. Using Continuous Access Journal, you can configure and manage highly reliable data replication systems using journal volumes to reduce chances of suspension of copy operations. |
| Compatible FlashCopy | This feature provides compatibility with IBM Extended Remote Copy (XRC) asynchronous remote copy operations for data backup and recovery in the event of a disaster. |

Table 8 Security features and functions

| Feature | Description |
|---|---|
| DKA Encryption | This feature implements encryption for both open systems and mainframe data using the encrypting disk adapter. It includes enhanced key support up to 32 separate encryption keys allows encryption to be used as access control for multi tenant environments. It also provides enhanced data security for the AES-XTS mode of operations. |
| External Authentication and Authorization | Storage management users of P9500 systems can be authenticated and authorized for storage management operations using existing customer infrastructure such as Microsoft Active Directory, LDAP, and RADIUS based systems. |
| Role Based Access Control (RBAC) | Provides greater granularity and access control for P9500 storage administration. This new RBAC model separates storage, security, and maintenance functions within the array. Storage Management users can receive their "role" assignments based on their group memberships in external authorization sources such as Microsoft Active Directory and LDAP. This RBAC model will also align with the RBAC implementation in HCS 7. |
| Resource Groups | Successor to the XP24000/XP20000 Disk Array Storage Logical Partition (SLPR). It allows for additional granularity and flexibility of the management of storage resources. |

Table 9 System maintenance features and functions

| Feature | Description |
|--------------------|--|
| Audit Log Function | The Audit Log function monitors all operations performed using Remote Web Console (and the SVP), generates a syslog, and outputs the syslog to the Remote Web Console computer. |
| SNMP Agent | Provides support for SNMP monitoring and management. Includes HP specific MIBs and enables SNMP based reporting on status and alerts. SNMP agent on the SVP gathers usage and error information and transfers the information to the SNMP manager on the host. |

Table 10 Host server based features and functions

| Feature | Description |
|-----------------------------------|---|
| RAID Manager | On open systems, performs various functions, including data replication and data protection operations by issuing commands from the host to the HP disk arrays. The RAID Manager software supports scripting and provides failover and mutual hot standby functionality in cooperation with host failover products. |
| Data Exchange | Transfers data between mainframe and open system platforms using the FICON channels for high speed data transfer without requiring network communication links or tape. |
| Dataset Replication for Mainframe | Operates with the Business Copy feature. Rewrites the OS management information (VTOC, VVDS, and VTOCIX) and dataset name and creates a user catalog for a Business Copy/Snapshot target volume after a split operation. Provides the prepare, volume divide, volume unify, and volume backup functions to enable use of a Business Copy target volume. |

2 Functional and operational characteristics

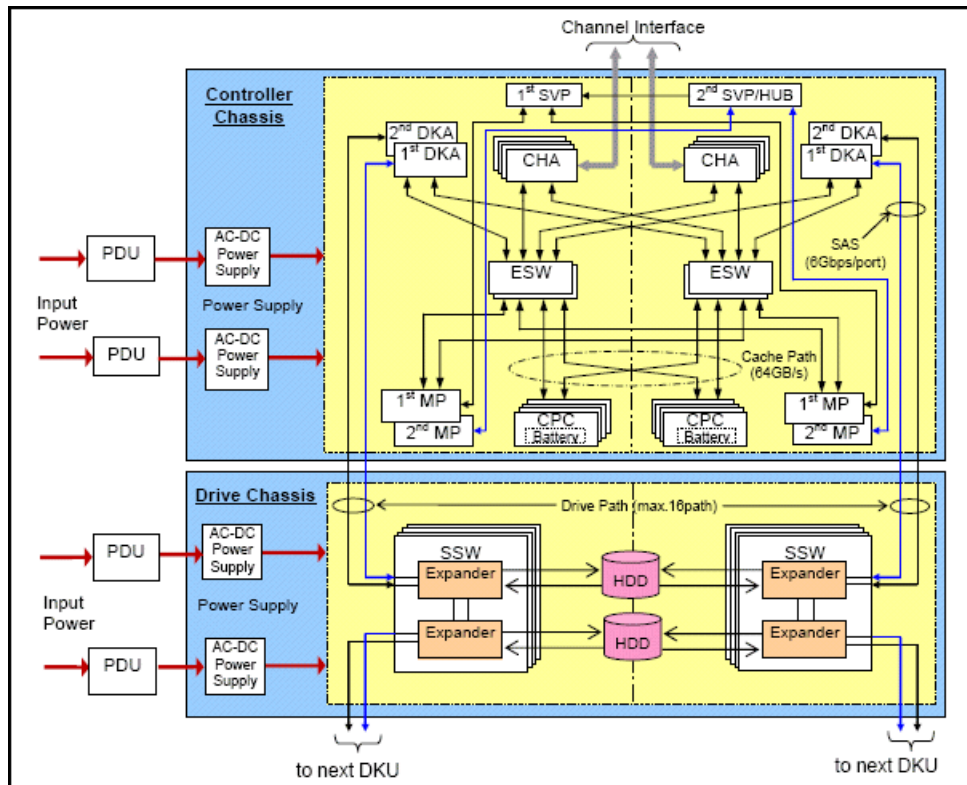
System architecture overview

This section briefly describes the architecture of the P9500 disk array.

Hardware architecture

The basic system architecture is shown in the following diagram.

Figure 5 P9500 architecture overview



The system consists of two main hardware assemblies:

- A controller chassis that contains the logic and processing components
- A drive chassis that contains the disk drives or solid state drives.

These assemblies are explained briefly in [“Introduction” \(page 6\)](#), and in detail in [“System components” \(page 54\)](#).

RAID implementation overview

This section provides an overview of the implementation of RAID technology on the P9500 disk array.

Array groups and RAID levels

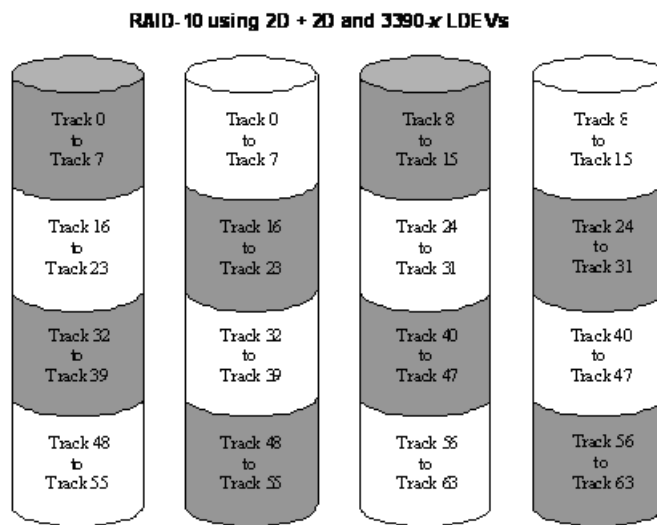
The array group (also called parity group) is the basic unit of storage capacity for the P9500 disk array. Each array group is attached to both boards of a DKA pair over 2 SAS paths, which enables all data drives in the array group to be accessed simultaneously by a DKA pair. Each controller rack has two drive chassis (factory designation DKU), and each drive chassis can have up to 128 physical data drives.

The P9500 supports the following RAID levels: RAID1, RAID5, RAID6. RAID0 is not supported on the P9500. When configured in four drive RAID5 parity groups (3D+1P), $\frac{3}{4}$ of the raw capacity is available to store user data, and $\frac{1}{4}$ of the raw capacity is used for parity data.

RAID1. Figure 6 (page 18) illustrates a sample RAID1 (2D+2D) layout. A RAID1 (2D+2D) array group consists of two pairs of data drives in a mirrored configuration, regardless of data drive capacity. A RAID1 (4D+4D) group combines two RAID1 (2D+2D) groups. Data is striped to two drives and mirrored to the other two drives. The stripe consists of two data chunks. The primary and secondary stripes are toggled back and forth across the physical data drives for high performance. Each data chunk consists of either eight logical tracks (mainframe) or 768 logical blocks (open systems). A failure in a drive causes the corresponding mirrored drive to take over for the failed drive. Although the RAID5 implementation is appropriate for many applications, the RAID1 option can be ideal for workloads with low cache hit ratios.

NOTE: When configuring RAID1 (4D+4D), HP recommends that both RAID1 (2D+2D) groups within a RAID1 (4D+4D) group be configured under the same DKA pair.

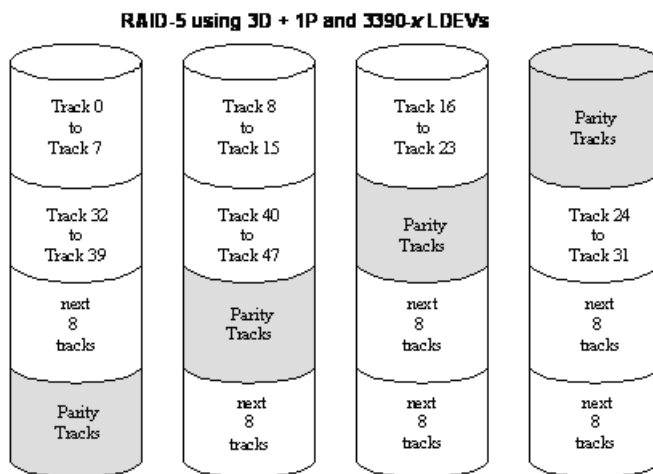
Figure 6 Sample RAID1 2D + 2D layout



RAID5. A RAID5 array group consists of four or eight data drives, (3D+1P) or (7D+1P). The data is written across the four (or eight) drives in a stripe that has three (or seven) data chunks and one parity chunk. Each chunk contains either eight logical tracks (mainframe) or 768 logical blocks (open). The enhanced RAID5+ implementation in the P9500 minimizes the write penalty incurred by standard RAID5 implementations by keeping write data in cache until an entire stripe can be built and then writing the entire data stripe to the drives. The 7D+1P RAID5 increases usable capacity and improves performance.

Figure 7 (page 19) illustrates RAID5 data stripes mapped over four physical drives. Data and parity are striped across each of the data drives in the array group (hence the term “parity group”). The logical devices (LDEVs) are evenly dispersed in the array group, so that the performance of each LDEV within the array group is the same. This figure also shows the parity chunks that are the Exclusive OR (EOR) of the data chunks. The parity and data chunks rotate after each stripe. The total data in each stripe is either 24 logical tracks (eight tracks per chunk) for mainframe data, or 2304 blocks (768 blocks per chunk) for open systems data. Each of these array groups can be configured as either 3390-x or OPEN-x logical devices. All LDEVs in the array group must be the same format (3390-x or OPEN-x). For open systems, each LDEV is mapped to a SCSI address, so that it has a TID and logical unit number (LUN).

Figure 7 Sample RAID5 3D + 1P layout (data plus parity stripe)



RAID6. A RAID6 array group consists of eight data drives (6D+2P). The data is written across the eight drives in a stripe that has six data chunks and two parity chunks. Each chunk contains either eight logical tracks (mainframe) or 768 logical blocks (open).

In the case of RAID6, data can be assured when up to two drives in an array group fail. Therefore, RAID6 is the most reliable of the RAID levels.

Sequential data striping

The P9500's enhanced RAID5 implementation attempts to keep write data in cache until parity can be generated without referencing old parity or data. This capability to write entire data stripes, which is usually achieved only in sequential processing environments, minimizes the write penalty incurred by standard RAID5 implementations. The device data and parity tracks are mapped to specific physical drive locations within each array group. Therefore, each track of an LDEV occupies the same relative physical location within each array group in the disk array.

In a RAID6 (dual parity) configuration, two parity drives are used to prevent loss of data in the unlikely event of a second failure during a rebuild of a previous failure.

LDEV striping across array groups

In addition to the conventional concatenation of RAID1 array groups (4D+4D), the P9500 supports LDEV striping across multiple RAID5 array groups for improved logical unit performance in open system environments. The advantages of LDEV striping are:

- Improved performance, especially of an individual logical unit, due to an increase in the number of data drives that constitute an array group.
- Better workload distribution: in the case where the workload of one array group is higher than another array group, you can distribute the workload by combining the array groups, thereby reducing the total workload concentrated on each specific array group.

The supported LDEV striping configurations are:

- LDEV striping across two RAID 5 (7D+1P) array groups. The maximum number of LDEVs in this configuration is 1000. See [Figure 8 \(page 20\)](#).
- LDEV striping across four RAID 5 (7D+1P) array groups. The maximum number of LDEVs in this configuration is 2000. See [Figure 9 \(page 20\)](#).

Figure 8 LDEV striping across 2 RAID5 (7D+1P) array groups

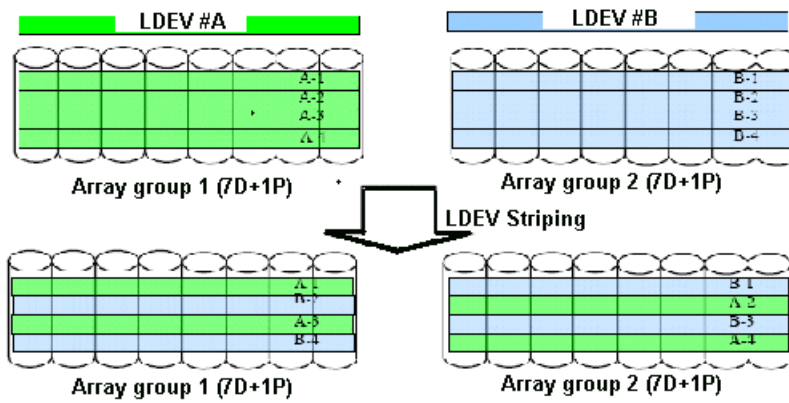
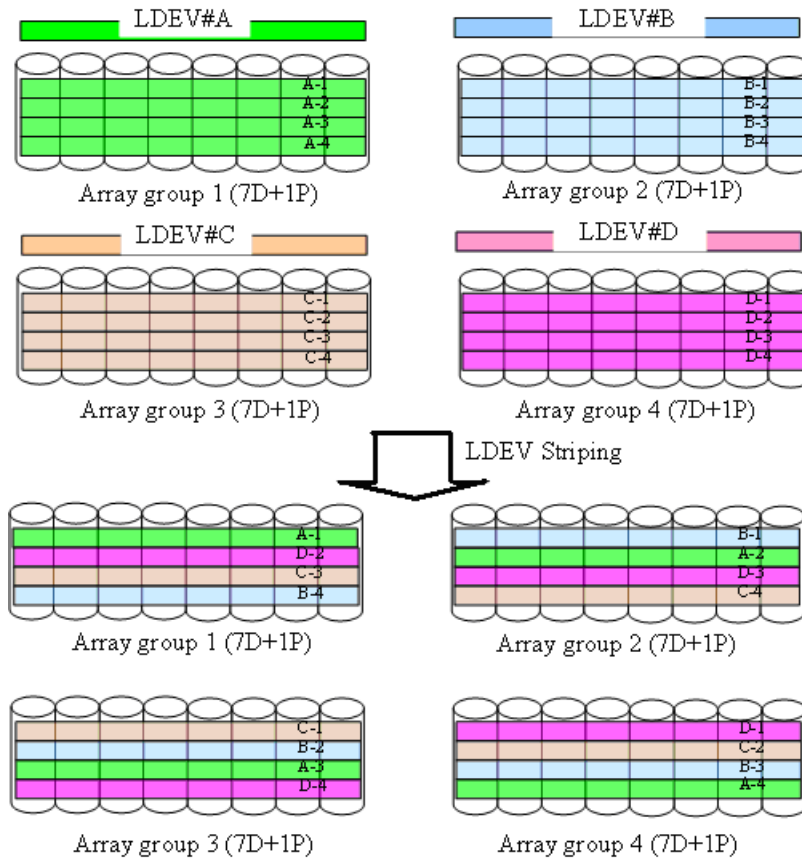


Figure 9 LDEV striping across 4 RAID5 (7D+1P) array groups



All data drives and device emulation types are supported for LDEV striping. LDEV striping can be used in combination with all P9500 data management functions.

CU Images, LVIs, and Logical Units

This section provides information about control unit images, logical volume images, and logical units.

CU images

The P9500 is configured with one control unit image for each 256 devices (one SSID for each 64 or 256 LDEVs) and supports a maximum of 510 CU images (255 in each logical disk controller, or LDKC).

The P9500 supports 2105 and 2107 control unit (CU) emulation types.

The mainframe data management features of the P9500 may have restrictions on CU image compatibility.

For further information on CU image support, see the *Mainframe Host Attachment and Operations Guide*, or contact HP.

Logical Volume images

The P9500 supports the following mainframe LVI types:

- 3390-3, -3R, -9, L, and -M. The 3390-3 and 3390-3R LVIs cannot be intermixed in the same disk array.
- 3380-3, -F, -K.

The LVI configuration of the P9500 disk array depends on the RAID implementation and physical data drive capacities. The LDEVs are accessed using a combination of logical disk controller number (00-01), CU number (00-FE), and device number (00-FF). All control unit images can support an installed LVI range of 00 to FF.

Logical Units

The P9500 disk array is configured with OPEN-V logical unit types. The OPEN-V logical unit can vary in size from 48.1 MB to 4 TB. For information on other logical unit types (e.g., OPEN-9), contact HP support.

For maximum flexibility in logical unit configuration, the P9500 provides the VLL and LUN Expansion (LUSE) features. Using VLL, users can configure multiple logical units under a single LDEV. Using Virtual LVI or LUSE, users can concatenate multiple logical units into large volumes. For further information on VLL and Virtual LVI, see the *HP XP P9000 Performance for Open and Mainframe Systems User Guide* and the *HP XP P9000 Provisioning for Open Systems User Guide*.

Mainframe operations

This section provides high level descriptions of mainframe compatibility, support, and configuration.

Mainframe compatibility and functionality

In addition to full System Managed Storage (SMS) compatibility, the P9500 disk array provides the following functions and support in the mainframe environment:

- Sequential data striping
- Cache fast write (CFW) and DASD fast write (DFW)
- Enhanced dynamic cache management
- Extended count key data (ECKD) commands
- Multiple Allegiance
- Concurrent Copy (CC)
- Peer-to-Peer Remote Copy (PPRC)
- Compatible FlashCopy
- Parallel Access Volume (PAV)
- Enhanced CCW
- Priority I/O queuing
- Red Hat Linux for IBM S/390 and zSeries

Mainframe operating system support

The P9500 disk array supports most major IBM Mainframe operating systems and Open System operating systems, such as Microsoft Windows, Oracle Solaris, IBM AIX, Linux, HP-UX, and VMware. For more complete information on the supported operating systems, go to: <http://www.hp.com>

Mainframe configuration

After a P9500 disk array has been installed, users can configure the disk array for mainframe operations.

See the following user documents for information and instructions on configuring your P9500 disk array for mainframe operations:

- The *HP XP P9000 Mainframe Host Attachment and Operations Guide* describes and provides instructions for configuring the P9500 for mainframe operations, including FICON attachment, hardware definition, cache operations, and device operations.
For detailed information on FICON connectivity, FICON/Open intermix configurations, and supported HBAs, switches, and directors for P9500, please contact HP support.
- The *HP XP P9000 Remote Web Console User Guide* provides instructions for installing, configuring, and using Remote Web Console to perform resource and data management operations on the P9500 disk arrays.
- The *HP XP P9000 Provisioning for Mainframe Systems User Guide* and *HP XP P9000 Volume Shredder for Open and Mainframe Systems User Guide* provides instructions for converting single volumes (LVs) into multiple smaller volumes to improve data access performance.

System option modes, host modes, and host mode options

This section provides detailed information about system option modes. Host modes and host mode options are also discussed.

System option modes

To provide greater flexibility and enable the P9500 disk array to be tailored to unique customer operating requirements, additional operational parameters, or system option modes, are available. At installation, the modes are set to their default values, as shown in the following table. Be sure to discuss these settings with HP Technical Support. The system option modes can only be changed by HP.

The following tables provide information about system option modes and SVP operations:

- [Table 11 \(page 23\)](#) lists the system option mode information for the P9500.
- [Table 12 \(page 51\)](#) specifies the details for mode 269 for Remote Web Console operations.
- [Table 13 \(page 51\)](#) specifies the details of mode 269 for SVP operations.

The system option mode information may change in future firmware releases. Contact HP for the latest information on the P9500 system option modes.

The system option mode information includes:

- Mode: Specifies the system option mode number.
- Category: Indicates the functions to which the mode applies.
- Description: Describes the action or function that the mode provides.
- Default: Specifies the default setting (ON or OFF) for the mode.
- MCU/RCU: For remote functions, indicates whether the mode applies to the main control unit (MCU) and/or the remote control unit (RCU).

Table 11 System option modes

| Mode | Category | Description | Default | MCU/RCU |
|------|------------------------------------|---|---------|---------|
| 20 | Public (Optional) | R-VOL read only function. | OFF | MCU |
| 22 | Common | <p>Regarding the correction copy or the drive copy, in case ECCs/LRC PINs are set on the track of copy source HDD, mode 22 can be used to interrupt the copy processing (default) or to create ECCs/LRC PINs on the track of copy target HDD to continue the processing.</p> <p>Mode 22 = ON:</p> <p>If ECCs/LRC PINs (up to 16) have been set on the track of copy source HDD, ECCs/LRC PINs (up to 16) will be created on the track of copy target HDD so that the copy processing will continue.</p> <p>If 17 or more ECCs/LRC PINs are created, the corresponding copy processing will be interrupted.</p> <p>Mode 22 = OFF (default)</p> <p>If ECCs/LRC PINs have been set on the track of copy source HDD, the copy processing will be interrupted. (first recover ECCs/LRC PINs by using the PIN recovery flow, and then perform the correction copy or the drive copy again)</p> <p>One of the controlling option for correction/drive copy.</p> | OFF | |
| 36 | HRC | Sets default function (CRIT=Y) option for SVP panel (HRC). | OFF | MCU |
| 64 | Continuous Access Synchronous Z | <p>Mode 64 = ON:</p> <ul style="list-style-type: none"> When receiving the Freeze command, in the subsystem, pair volumes that fulfill the conditions below are suspended and the status change pending (SCP) that holds write I/Os from the host is set. The path between MCU and RCU is not deleted. Query is displayed only but unusable. When receiving the RUN command, the SCP status of the pairs that fulfill the conditions below is released. When a Failure Suspend occurs when Freeze Option Enable is set, except the pair in which the Failure Suspend occurs, other pairs that fulfill conditions below go into SCP state: <ul style="list-style-type: none"> - Continuous Access Synchronous Sync M-VOL - Mainframe Volume - Pair status: Duplex/Pending <p>Mode 64 = OFF (default):</p> <ul style="list-style-type: none"> When receiving the Freeze command, pairs that fulfill the conditions below are suspended and the SCP is set. In the case of CU emulation type 2105/2017, the path between MCU and RCU is deleted, while the path is not deleted but unusable with Query displayed only in the case of CU emulation type 3990. When receiving the RUN command, the SCP status of the pairs that fulfill the conditions below is released. When a Failure Suspend occurs while the Freeze Option Enable is set, except the pair in which the Failure Suspend occurs, other pairs that fulfill the conditions below go into SCP state. <p>Conditions:</p> <ul style="list-style-type: none"> - Continuous Access Synchronous Sync M-VOL - Mainframe Volume | | |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|--------------|---------------------------------|--|---------|---------|
| | | <ul style="list-style-type: none"> Pair status: Duplex/Pending A pair whose RCU# is identical to the RCU for which the Freeze command is specified. | | |
| 64 (cont) | Continuous Access Synchronous Z | <p>Notes:</p> <ol style="list-style-type: none"> When all the following conditions are met, set Mode 64=ON. When all the following conditions are met, set Mode 64=ON. <ul style="list-style-type: none"> Customer requests to stop the update I/O operation to the RCU of a Continuous Access Synchronous Z pair for the whole subsystem. Disaster Recovery function such as GDPS, HyperSwap, or Fail Over/ Fail Back, which requires compatibility with IBM storage, is not used as this Mode 64 operates without having compatibility with IBM storage. Only Peer-to-Peer-Remote-Copy operation. (Do not use it in combination with Business Continuity Manager.) Even though the Failover command is not an applicable criterion, when executing the Failover command while Mode 114 is ON, since ports are not automatically switched, the Failover command fails. With increase of Sync pairs in subsystem, the time period to report the completion of Freeze command and RUN command gets longer (estimate of time to report completion: 1 second per 1000 pairs), and MIH may occur. | . | MCU/RCU |
| 80 | Business Copy Z | <ul style="list-style-type: none"> For RAID 300/400/450 (SI for OPEN or Mainframe) In response to the Restore instruction from the host or Storage Navigator, the following operation is performed regardless of specifying Quick or Normal. For RAID 500/600/700 (SI for OPEN) In response to the Restore instruction from the host, if neither Quick nor Normal is specified, the following operation is performed <p>Mode 80 = ON: Normal Restore / Reverse Copy is performed. Mode 80 = OFF: Quick Restore is performed.</p> <p>Notes.</p> <ol style="list-style-type: none"> This mode is applied when the specification for Restore of SI is switched between Quick (default) and Normal. The performance of Restore differs depending on the Normal or Quick specification. | OFF | - |
| 87 | Business Copy | <p>Determines whether NormalCopy or QuickResync, if not specified, is performed at the execution of pairresync by CCI.</p> <p>Mode 87 = ON: QuickResync is performed. Mode 87 = OFF: NormalCopy is performed.</p> | OFF | - |
| 104 | HRC | Changes the default CGROUP Freeze option. | OFF | MCU |
| 114 | HRC | <p>This mode enables or disables the LCP/RCP port to be automatically switched over when the PPRC command ESTPATH/DELPATH is executed.</p> <p>Mode 114 = ON: Automatic port switching during ESTPATH/DELPATH is enabled.</p> <p>Mode 114 = OFF (default): Automatic port switching during ESTPATH/DELPATH is disabled.</p> <p>Notes:</p> | OFF | MCU |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|---------------|---|---------|---------|
| | | <ol style="list-style-type: none"> 1. If you select an incorrect port while the mode is set to ON, and if ESTPATH is executed when no logic path exists, the port is switched to RCP.. 2. Set this mode to OFF before using TPC-R (IBM software for disaster recovery). | | |
| 122 | Business Copy | <p>For Split or Resync request from the Mainframe host and Storage Navigator, Mode 122 = ON:</p> <ul style="list-style-type: none"> • By specifying Split or Resync, Steady/Quick Split or Normal/Quick Resync is respectively executed in accordance with Normal/Quick setting <p>Mode 122 = OFF (default)?</p> <ul style="list-style-type: none"> • By specifying Split or Resync, Steady/Quick Split or Normal/Quick Resync is respectively executed in accordance with Normal/Quick setting. For details, see "SOM 122" sheet <p>Note:</p> <p>(1) For RAID500 and later models, this mode is applied to use scripts etc that are used on RAID400 and 450 (2) In the case of RAID500 and later models, executing the pairresync command from RAID Manager may be related to the SOM 087 setting.</p> <p>(3) When performing At-Time Split from RAID Manager</p> <ul style="list-style-type: none"> - Set this mode to OFF in the case of RAID450 - Set this mode to OFF or specify the environment variable HORCC_SPLT for Quick in the case of RAID500 and later. Otherwise, Pairsplit may turn timeout. <p>(4) The mode becomes effective after specifying Split/Resync following the mode setting. The mode function does not work if it is set during the Split/Resync operation</p> | OFF | - |
| 187 | Common | Yellow Light Option (only for XP product) | OFF | - |
| 190 | HRC | Cnt Ac-S Z – Allows you to update the VOLSER and VTOC of the R-VOL while the pair is suspended if both mode 20 and 190 are ON | OFF | RCU |
| 269 | Common | <p>High Speed Format for CVS (Available for all dku emulation type)</p> <p>(1) High Speed Format support</p> <p>When redefining all LDEVs included in an ECC group using Volume Initialize or Make Volume on CVS setting panel, LDEV format, as the last process, will be performed in high speed.</p> <p>(2) Make Volume feature enhancement</p> <p>In addition, with supporting the feature, the Make Volume feature (recreating new CVs after deleting all volumes in a VDEV), which so far was supported for OPEN-V only, is available for all emulation types.</p> <p>Mode 269 = ON:</p> <p>The High Speed format is available when performing CVS operations on Storage Navigator or performing LDEV formats on the Maintenance window of the SVP for all LDEVs in a parity group.</p> <p>Mode 269 = OFF (default):</p> <p>As usual, only the low speed format is available when performing CVS operations on Storage Navigator. In addition, the LDEV specifying format on the Maintenance window of the SVP is in low speed as well.</p> | OFF | MCU/RCU |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| | | Notes: <ol style="list-style-type: none"> For more details about mode 269, see worksheet "Mode269 detail for RAID700". Mode 269 is effective only when using the SVP to format the CVS. | | |
| 278 | Open | Tru64 (Host Mode 07) and OpenVMS (Host Mode 05) Caution: Host offline: Required | OFF | - |
| 292 | HRC | Issuing OLS when Switching Port In case the mainframe host (FICON) is connected with the CNT-made FC switch (FC9000 etc.), and is using along with the TrueCopy S/390 with Open Fibre connection, the occurrence of Link Incident Report for the mainframe host from the FC switch will be deterred when switching the CHT port attribute (including automatic switching when executing CESTPATH and CDELPATH in case of Mode 114=ON). Mode 292=ON: When switching the port attribute, issue the OLS (100ms) first, and then reset the Chip. Mode 292=OFF (default): When switching the port attribute, reset the Chip without issuing the OLS. | OFF | MCU/RCU |
| 305 | Mainframe | This mode enables the pre-label function (creation of VTOC including VOLSER). Mode 305 = ON: Pre-label function is enabled Note: <ol style="list-style-type: none"> Set SOM 305 to ON before performing LDEV Format for a mainframe volume if you want to perform OS IPL (volume online) without fully initializing the volume after the LDEV Format. However, full initialization is required in actual operation. Processing time of LDEV format increases by as much as full initialization takes. The following functions and conditions are not supported. <ul style="list-style-type: none"> Quick format 3390-A (Dynamic Provisioning attribute) Volume Shredder Full initialization is required in actual operation. | OFF | MCU/RCU |
| 308 | Continuous Access Synchronous Z Continuous Access Journal Z | SIM RC=2180 option <Description> SIM RC=2180 (RIO path failure between MCU and RCU) was not reported to host. DKC reports SSB with F/M=F5 instead of reporting SIM RC=2180 in the case. Micro-program has been modified to report SIM RC=2180 with newly assigned system option Mode as individual function for specific customer. Usage: Mode 308 = ON SIM RC 2180 is reported which is compatible with older Hitachi specification Mode 308 = OFF Reporting is compatible with IBM - Sense Status report of F5. | OFF | MCU |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|---|---------|---------|
| 448 | Continuous Access Journal Continuous Access Journal Z | <p>Mode 448 = ON: (Enabled) If the SVP detects a blocked path, the SVP assumes that an error occurred, and then immediately splits (suspends) the mirror.</p> <p>Mode 448 = OFF: (Disabled) If the SVP detects a blocked path and the path does not recover within the specified period of time, the SVP assumes that an error occurred, and then splits (suspends) the mirror.</p> <p>Note: The mode 448 setting takes effect only when mode 449 is set to OFF.</p> | OFF | |
| 449 | Continuous Access Journal Continuous Access Journal Z | <p>Detecting and monitoring path blockade between MCU and RCU of Universal Replicator/Universal Replicator for z/OS</p> <p><Functionality></p> <ul style="list-style-type: none"> - Mode 449 on: Detecting and monitoring of path blockade will NOT be performed. - Mode 449 off (default *) : Detecting and monitoring of the path blockade will be performed. <p>* Newly shipped DKC will have Mode 449 = ON as default.</p> <p>Note: The mode status will not be changed by the microcode exchange.</p> | | |
| 454 | Cache Partition | <p>CLPR (Function of Virtual Partition Manager) partitions the cache memory in the disk subsystem into multiple virtual cache and assigns the partitioned virtual cache for each use. If a large amount of cache is required for a specific use, it can minimize the impact on other uses. The CLPR function works as follows depending on whether SOM 454 is set to ON or OFF.</p> <p>Mode 454 = OFF (default):</p> <p>The amount of the entire destage processing is periodically determined by using the highest workload of all CLPRs (*a). (The larger the workload is, the larger the amount of the entire destage processing becomes.)</p> <p>*a: $(\text{Write Pending capacity of CLPR\#x}) \div (\text{Cache capacity of CLPR\#x}), x=0 \text{ to } 31$</p> <p>CLPR whose value above is the highest of all CLPRs</p> <p>Because the destage processing would be accelerated depending on CLPR with high workload, when the workload in a specific CLPR increases, the risk of host I/O halt would be reduced.</p> <p>Therefore, set Mode 454 to OFF in most cases.</p> <p>Mode 454 = ON:</p> <p>The amount of the entire destage processing is periodically determined by using the workload of the entire system (*b). (The larger the workload is, the larger the amount of the entire destage processing becomes.)</p> <p>*b: $(\text{Write Pending capacity of the entire system}) \div (\text{Cache capacity of the entire system})$</p> <p>Because the destage processing would not be accelerated even if CLPR has high workload, when the workload in a specific CLPR increases, the risk of host I/O halt would be increased. Therefore, it is limited to set Mode 454 to ON only when a CLPR has constant high workload and it gives priority to I/O</p> | OFF | |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| 457 | External Storage | <p>1. High Speed LDEV Format for External Volumes Mode 457 = ON: The high speed LDEV format for external volumes is available by setting system option mode 457 to ON. When System Option Mode 457 is ON, when selecting the external volume group and performing the LDEV format, any Write processing on the external logical units will be skipped. However, if the emulation type of the external LDEV is a mainframe system, the Write processing for mainframe control information only will be performed after the write skip.</p> <p>2. Support for Mainframe Control Block Write GUI Mode 457 = ON: The high speed LDEV format for external volumes is supported. Control Block Write of the external LDEVs in Mainframe emulation is supported by Remote Web Console (GUI).</p> <p>Notes:</p> <p>1. If the LDEV is not written with data "0" before performing the function, the LDEV format may fail.</p> <p>2. After the format processing, make sure to set system option mode 457 to OFF.</p> | OFF | MCU/RCU |
| 459 | Business Copy Z, Business Copy | <p>When the secondary volume of an BC/BC Z pair is an external volume, the transaction to change the status from SP-PEND to SPLIT is as follows:</p> <p>1. Mode 459 = ON when creating an BC/BC Z pair: The copy data is created in cache memory. When the write processing on the external storage completes and the data is fixed, the pair status will change to SPLIT.</p> <p>2. Mode 459 = OFF when creating an BC/BC Z pair: Once the copy data has been created in cache memory, the pair status will change to SPLIT. The external storage data is not fixed (current spec).</p> | OFF | - |
| 464 | Continuous Access Synchronous Z | <p>SIM Report without Inflow Limit</p> <p>For Cnt Ac-S, the SIM report for the volume without inflow limit is available when mode 464 is set to ON.</p> <p>SIM: RC=490x-yy (x=CU#, yy=LDEV#)</p> | OFF | MCU |
| 466 | Continuous Access Journal, Continuous Access Journal Z | <p>For Cnt Ac-J/Cnt Ac-J Z operations it is strongly recommended that the path between main and remote storage systems have a minimum data transfer speed of 100 Mbps. If the data transfer speed falls to 10 Mbps or lower, Cnt Ac-J operations cannot be properly processed. As a result, many retries occur and Cnt Ac-J pairs may be suspended. Mode 466 is provided to ensure proper system operation for data transfer speeds of at least 10 Mbps.</p> <p>Mode 466 = ON: Data transfer speeds of 10 Mbps and higher are supported. The JNL read is performed with 4-multiplexed read size of 256 KB.</p> <p>Mode 466 = OFF: For conventional operations. Data transfer speeds of 100 Mbps and higher are supported. The JNL read is performed with 32-multiplexed read size of 1 MB by default.</p> <p>Note: The data transfer speed can be changed using the Change JNL Group options.</p> | OFF | |
| 467 | Business Copy/Snapshot, Business Copy Z, Compatible FlashCopy, | <p>For the following features, the current copy processing slows down when the percentage of "dirty" data is 60% or higher, and it stops when the percentage is 75% or higher. Mode 467 is provided to prevent the percentage from exceeding 60%, so that the host performance is not affected.</p> | ON | |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|---|--|---------|---------|
| | Snapshot, Auto LUN, External Storage | <p>Business Copy, Business Copy Z, Compatible FlashCopy, Snapshot, Auto LUN, External Storage</p> <p>Mode 467 = ON: Copy overload prevention. Copy processing stops when the percentage of “dirty” data reaches 60% or higher. When the percentage falls below 60%, copy processing restarts.</p> <p>Mode 467 = OFF: Normal operation. The copy processing slows down if the dirty percentage is 60% or larger, and it stops if the dirty percentage is 75% or larger.</p> <p>Caution: This mode must always be set to ON when using an external volume as the secondary volume of any of the above-mentioned replication products.</p> <p>Note: It takes longer to finish the copy processing because it stops for prioritizing the host I/O performance.</p> | | |
| 471 | <p>Snapshot (Earlier than 70-05-0x-00/00)</p> <p>Snapshot, Fast Snap (70-05-0x-00/00 or higher)</p> | <p>Since the SIM-RC 601xxx that are generated when the usage rate of Pool used by Snapshot exceeds the threshold value can be resolved by users, basically they are not reported to the maintenance personnel. This option is used to inform maintenance personnel of these SIMs that are basically not reported to maintenance personnel in case these SIMs must be reported to them.</p> <p>SIMs reported by setting the mode to ON are:</p> <ul style="list-style-type: none"> • SIM-RC 601xxx (Pool utilization threshold excess) (Earlier than 70-05-0x-00/00) • SIM-RC 601xxx (Pool utilization threshold excess)/ 603000 (SM Space Warning) (70-05-0x-00/00 or higher:) <p>Mode 471 = ON: This kind of SIMs is reported to maintenance personnel. Mode 471 = OFF (default): This kind of SIMs is not reported to maintenance personnel. Note: Set this mode to ON when it is required to inform maintenance personnel of the SIM-RC (*)</p> <p>SIMs reported by setting the mode to ON are:</p> <ul style="list-style-type: none"> • SIM-RC 601xxx (Pool utilization threshold excess) (Earlier than 70-05-0x-00/00) • SIM-RC 601xxx (Pool utilization threshold excess)/ 603000 (SM Space Warning) (70-05-0x-00/00 or higher:) | OFF | |
| 474 | Continuous Access Journal, Continuous Access Journal Z | <p>UR initial copy performance can be improved by issuing a command from Raid Manager/BC Manager to execute a dedicated script consists of UR initial copy (Nocopy), UR suspend, TC (Sync) initial copy, TC (Sync) delete, and UR resync.</p> <p>Mode 474 = ON:</p> <p>For a suspended UR pair, a TC-Sync pair can be created with the same P-VOL/S-VOL so that UR initial copy time can be reduced by using the dedicated script.</p> <p>Mode 474 = OFF (default):</p> <p>For a suspended UR pair, a TC-Sync pair cannot be created with the same P-VOL/S-VOL. For this, the dedicated script cannot be used.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. Set this mode for both MCU and RCU. 2. When the mode is set to ON; <ul style="list-style-type: none"> - Execute all of pair operations from Raid Manager/ BCM. - Use a dedicated script. | OFF | MCU/RCU |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|---|---------|---------|
| | | <ul style="list-style-type: none"> - Initial copy operation is prioritized over update I/O. Therefore, the processing speed of the update I/O slows down by about 15?s per command. 3. If this mode is set to ON, the processing speed of update I/O slows down by about 15?s per command, version downgrade is disabled, and Take Over is not available. 4. If the mode is not set to ON for both or either sides, the behavior is as follows. - Without setting on both sides: Normal UR initial copy performance. - With setting on MCU/without setting on RCU: TC Sync pair creation fails. - Without setting on MCU/with setting on RCU: The update data for P-VOL is copied to the S-VOL in synchronous manner. - While the mode is set to ON, micro-program downgrade is disabled. - While the mode is set to ON, Take Over function is disabled. - The mode cannot be applied to a UR pair that is the 2nd mirror in URxUR multi-target configuration or URxUR cascade configuration. If applied, TC pair creation is rejected with SSB=CBEE output. | | |
| 484 | Continuous Access Synchronous Z Business Copy Z | <p>The IBM-compatible PPRC FC path interface has been supported with RAID500 50-06-11-00/00. As the specification of QUERY display using this interface (hereinafter called New Spec) is different from the current specification (hereinafter called Previous Spec), this mode enables to display the PPRC path QUERY with the New Spec or Previous Spec.</p> <p>Mode 484 = ON: PPRC path QUERY is displayed with the New Spec.</p> <p>Mode 484 = OFF (default): PPRC path QUERY is displayed with the Previous Spec (ESCON interface).</p> <p>Note:</p> <p>(1) Set this mode to ON when you want to maintain compatibility with the Previous Spec for PPRC path QUERY display under the environment where IBM host function (such as PPRC and GDPS) is used.</p> <p>(2) When an old model or a RAID500 that doesn't support this mode is connected using Cnt Ac-S Z, set this mode to OFF.</p> <p>(3) If the display specification is different between MCU and RCU, it may cause malfunction of host.</p> <p>(4) When TPC-R is used, which is IBM software for disaster recovery, set this mode to ON.</p> | OFF | MCU/RCU |
| 491 | Business Copy Business Copy Z | <p>Mode 491 is used for improving the performance of Business Copy/ Business Copy Z/ ShadowImage FCv1.</p> <p>Mode ON: The option (Reserve05) of Business Copy/ Business Copy Z is available. If the option is set to ON, the copy of Business Copy/ Business Copy Z/ ShadowImage FCv1 will be performed from 64 processes to 128 processes so that the performance will be improved.</p> <p>Mode OFF (default): The option (Reserve05) of Business Copy/ Business Copy Z is unavailable. The copy of Business Copy/ Business Copy Z/ ShadowImage FCv1 is performed with 64 processes.</p> | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|---|---------|---------|
| | | Note: 1. Make sure to apply mode 491 when the performance of Business Copy/ Business Copy Z/ ShadowImage FCv1 is considered to be important. 2. Make sure not to apply the mode when the host I/O performance is considered to be important. 3. The mode will be noneffective if 3 or more pairs of DKAs are not mounted. 4. Make sure to set mode 467 to OFF when using mode 491, since the performance may not improve. 5. The mode is noneffective for the NSC model. | | |
| 495 | NAS | Function: That the secondary volume where S-VOL Disable is set means the NAS file system information is imported in the secondary volume. If the user has to take a step to release the S-VOL Disable attribute in order to perform the restore operation, it is against the policy for the guard purpose and the guard logic to have the user uninvolved. In this case, in the NAS environment, Mode 495 can be used to enable the restore operation. Mode 495 = ON: The restore operation ?Reverse Copy, Quick Restore) is allowed on the secondary volume where S-VOL Disable is set. Mode 495 = OFF (default): The restore operation ?Reverse Copy, Quick Restore) is not allowed on the secondary volume where S-VOL Disable is set. | OFF | |
| 506 | Continuous Access Journal, Continuous Access Journal Z | This option is used to enable Delta Resync with no host update I/O by copying only differential JNL instead of copying all data. The HUR Differential Resync configuration is required. Mode 506 = ON: Without update I/O: Delta Resync is enabled. With update I/O: Delta Resync is enabled. Mode 506 = OFF (default): Without update I/O: Total data copy of Delta Resync is performed. With update I/O: Delta Resync is enabled. Note: Even when mode 506 is set to ON, the Delta Resync may fail and only the total data copy of the Delta Resync function is allowed if the necessary journal data does not exist on the primary subsystem used for the Delta Resync operation. | OFF | MCU/RCU |
| 530 | Continuous Access Journal Z | When aContinuous Access Journal Z pair is in the Duplex state, this option switches the display of Consistency Time (C/T) between the values at JNL restore completion and at JNL copy completion. Mode 530 = ON: - C/T displays the value of when JNL copy is completed. Mode 530 = OFF (default): C/T displays the value of when JNL restore is completed. Note: At the time of Purge suspend or RCU failure suspend, the C/T of Continuous Access Journal Z displayed by Business Continuity | OFF | RCU |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|---|---|---------|---|
| | | Manager or Storage Navigator may show earlier time than the time showed when the pair was in the Duplex state. | | |
| 531 | Open and Mainframe | <p>When PIN data is generated, the SIM currently stored in SVP is reported to the host.</p> <p>Mode 531 = ON:</p> <p>The SIM for PIN data generation is stored in SVP and reported to the host.</p> <p>Mode 531 = OFF:</p> <p>The SIM for PIN data generation is stored in SVP only, not reported to the host, the same as the current specification.</p> | OFF | MCU/RCU |
| 548 | Continuous Access Synchronous Z, Continuous Access Journal Z, or ShadowImage for Mainframe from BCM | <p>This option prevents pair operations of TCz, URz, or Slz via Command Device online.</p> <p>Mode 548 = ON:</p> <p>Pair operations of TC for z/OS, UR for z/OS, or SI for z/OS via online Command Device are not available. SSB=0x64fb is output.</p> <p>Mode 548 = OFF:</p> <p>Pair operations of TC for z/OS, UR for z/OS, or SI for z/OS via online Command Device are available. SIM is output.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. When Command Device is used online, if a script containing an operation via Command Device has been executed, the script may stop if this option is set to ON. As described in the BCM user's guide, the script must be performed with Command Device offline. 2. This option is applied to operations from BCM that is operated on MVS. | | |
| 556 | Open | <p>Prevents an error code from being set in the 8 - 11th bytes in the standard 16-byte sense byte.</p> <p>Mode 556 = ON:</p> <p>An error code is not set in the 8 - 11th bytes in the standard 16-byte sense byte.</p> <p>Mode 556 = OFF (default):</p> <p>An error code is set in the 8 - 11th bytes in the standard 16-byte sense byte.</p> | OFF | MCU/RCU |
| 561 | Business Copy, External Storage | <p>Allows Quick Restore for external volumes with different Cache Mode settings.</p> <p>Mode 561 = ON:</p> <p>Quick Restore for external volumes with different Cache Mode settings is prevented.</p> <p>Mode 561 = OFF (default):</p> <p>Quick Restore for external volumes with different Cache Mode settings is allowed.</p> | OFF | MCU/RCU |
| 573 | Continuous Access Synchronous Z Business Copy Z | <p>For the DKU emulation type 2105/2107, specifying the CASCADE option for the ICKDSF ESTPAIR command is allowed.</p> <p>Mode 573 = ON:</p> <p>The ESTPAIR CASCADE option is allowed.</p> <p>Mode 573 = OFF (default):</p> <p>The ESTPAIR CASCADE option is not allowed. (When specified, the option is rejected.)</p> | OFF | <p>MCU/RCU</p> <p>The unit where Cnt Ac-S Z and BC Z in a cascading configuration use the same volume</p> |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|-----------------------------|---|---------|---------|
| | | <p>Notes:</p> <ol style="list-style-type: none"> 1. When DKC emulation type is 2105/2107, this mode is applied in the case where pair creation in Cnt Ac-S Z – BC Z cascading configuration in the ICKDSF environment fails with the following message output. Message: ICK30111I DEVICE SPECIFIED IS THE SECONDARY OF A DUPLEX OR PPRC PAIR 2. The CASCADE option can be specified in the TSO environment also. 3. Although the CASCADE option can be specified for the ESTPAIR command, the PPRC-XD function is not supported. 4. Perform thorough pre-check for any influence on GDPS/PPRC. 5. The SOM must be enabled only when the CASCADE option is specified for the ESTPAIR command for the DKC emulation type 2105/2107. | | |
| 589 | External Storage | <p>Turning this option ON changes the frequency of progress updates when disconnecting an external volume. of disconnection is changed.</p> <p>improvement in destaging to the pool by achieving efficient HDD access.</p> <p>Mode 589 = ON: For each external volume, progress is updated only when the progress rate is 100%</p> <p>Mode 589 = OFF (default): Progress is updated when the progress rate exceeds the previous level.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Set this option to ON when disconnecting an external volume while the specific host IO operation is online and its performance requirement is severe. 2. Whether the disconnecting status for each external volume is progressed or not cannot be confirmed on Remote Web Console (It indicates “-” until just before the completion and at the last it changes to 100%). | OFF | . |
| 598 | Continuous Access Journal Z | <p>This mode is used to report SIMs (RC=DCE0 to DCE3) to a Mainframe host to warn that a URz journal is full.</p> <p>Mode 598 = ON:</p> <p>SIMs (RC=DCE0 to DEC3) to warn that a JNL is full are reported to SVP and the host.</p> <p>Mode 598= OFF (default):</p> <p>SIMs (RC=DCE0 to DEC3) to warn that a JNL is full are reported to SVP only.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied if SIMs (RC=DCE0 to DCE3) need to be reported to a Mainframe host. 2. The SIMs are not reported to the Open server. 3. SIMs for JNL full (RC=DCE0 and DCE1) on MCU are reported to the host connected with MCU. 4. SIMs for JNL full (RC=DCE2 and DCE3) on RCU are reported to the host connected with RCU. | ON | . |
| 676 | Audit Log | <p>This option is used to set whether an audit log is to be stored onto the system disk or not.</p> <p>Mode 676 = ON:</p> <p>An audit log is stored onto the system disk.</p> | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| | | <p>Mode 676 = OFF (default):</p> <p>An audit log is not stored onto the system disk.</p> <p>This mode is also enabled/disabled by enabling/disabling Audit Log Buffer on the [Audit Log Setting...] window, which can be opened by selecting [Settings] -> [Security] -> [Audit Log Setting...] on Storage Navigator.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This option is applied to the sites where the level of importance of an audit log is high. 2. A system disk with available space of more than 130 MB (185 cylinders when the track format is 3380/6586/NF80, and 154 cylinders when the track format is 3390/6588) must exist. (Otherwise, audit log is not stored even this option is ON). 3. Make sure to turn this option on after preparing a normal system disk that meets the condition in (2). If Define Configuration & Install is performed, turn this option on after formatting the system disk. | | |
| 689 | Continuous Access Synchronous Z Business Copy Z | <p>This option is used to slow down the initial copy and resync copy operations when the Write Pending rate on RCU exceeds 60%.</p> <p>Mode 689 = ON:</p> <p>The initial copy and resync copy operations are slowed down when the Write Pending rate on RCU exceeds 60%.</p> <p>*: From RAID700, if the Write Pending rate of CLPR where the initial copy target secondary volume belongs to is not over 60% but that of MP PCB where the S-VOL belongs to is over 60%, the initial copy operation is slowed down.</p> <p>Mode 689 = OFF (default):</p> <p>The initial copy and resync copy operations are not slowed down when the Write Pending rate on RCU exceeds 60% (the same as before).</p> <p>Note:</p> <ol style="list-style-type: none"> 1. This mode can be set online. 2. The micro-programs on both MCU and RCU must support this mode. 3. This mode should be set per customer's requests. 4. If the Write Pending status long keeps 60% or more on RCU, it takes extra time for the initial copy and resync copy to be completed by making up for the slowed down copy operation. 5. From RAID700, if the Write Pending rate of CLPR where the initial copy target secondary volume belongs to is not over 60% but that of MP PCB where the S-VOL belongs to is over 60%, the initial copy operation is slowed down. | OFF | . |
| 690 | Continuous Access Journal, Continuous Access Journal Z | <p>This option is used to prevent Read JNL or JNL Restore when the Write Pending rate on RCU exceeds 60% as follows:</p> <ul style="list-style-type: none"> • When CLPR of JNL-Volume exceeds 60%, Read JNL is prevented. • When CLPR of Data (secondary)-Volume exceeds 60%, JNL Restore is prevented. <p>Mode 690 = ON:</p> <p>Read JNL or JNL Restore is prevented when the Write Pending rate on RCU exceeds 60%.</p> <p>Mode 690 = OFF (default):</p> | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|------------------|---|---------|---------|
| | | <p>Read JNL or JNL Restore is not prevented when the Write Pending rate on RCU exceeds 60% (the same as before).</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode can be set online. 2. This mode should be set per customer's requests. 3. If the Write Pending status long keeps 60% or more on RCU, it takes extra time for the initial copy to be completed by making up for the prevented copy operation. 4. If the Write Pending status long keeps 60% or more on RCU, the pair status may become Suspend due to the JNL-Vol being full. | | |
| 696 | Open | <p>This mode is available to enable or disable the QoS function.</p> <p>Mode 696 = ON:</p> <p>QoS is enabled. (In accordance with the Share value set to SM, I/Os are scheduled. The Share value setting from RMLIB is accepted)</p> <p>Mode 696 = OFF (default):</p> <p>QoS is disabled. (The Share value set to SM is cleared. I/O scheduling is stopped. The Share value setting from host is rejected)</p> <p>Note:</p> <ol style="list-style-type: none"> 1. Set this mode to ON when you want to enable the QoS function. | OFF | . |
| 701 | External Storage | <p>Issues the Read command at the logical unit discovery operation using Ext Stor.</p> <p>Mode 701 = ON:</p> <p>The Read command is issued at the logical unit discovery operation.</p> <p>Mode 701 = OFF:</p> <p>The Read command is not issued at the logical unit discovery operation.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. When the Open LDEV Guard attribute (VMA) is defined on an external device, set the system option to ON. 2. When this option is set to ON, it takes longer time to complete the logical unit discovery. The amount of time depends on external storages. 3. With this system option OFF, if searching for external devices with VMA set, the VMA information cannot be read. 4. When the mode is set to ON while the following conditions are met, the external volume is blocked. <ol style="list-style-type: none"> a. RAID700 70-03-3x-00/00 or higher version is used on the storage system. b. An external volume to which Nondisruptive Migration (NDM) attribute is set exists. c. The external volume is reserved by the host 5. As the VMA information is USP/NSC specific, this mode does not need to be ON when the external storage is other than USP/NSC. 6. Set the mode to OFF when the following conditions are met. <ol style="list-style-type: none"> a. RAID700 70-03-3x-00/00 or higher version is used on the storage system | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|--------------------|---------------------------------------|---|---------|---------|
| | | b. An external volume to which Nondisruptive Migration (NDM) attribute is set exists. | | |
| 704 | Open and Mainframe | <p>To reduce the chance of MIH, this option can reduce the priority of BC, VM, CoW Snapshot, Flash Copy or Resync copy internal IO requests so that host IO has a higher priority. This mode creates new work queues where these jobs can be assigned with a lower priority.</p> <p>Mode 704 = ON:</p> <p>Copy processing requested is registered into a newly created queue so that the processing is scheduled with lower priority than host I/O.</p> <p>Mode 704 = OFF: (Default)</p> <p>Copy processing requested is not registered into a newly created queue. Only the existing queue is used.</p> <p>Note:</p> <p>If the PDEV is highly loaded, the priority of Read/Write processing made by BC, VM, Snapshot, Compatible FlashCopy or Resync may become lower. As a consequence the copy speed may be slower.</p> | OFF | . |
| 720 | External Storage (Mainframe and Open) | <p>Supports the Active Path Load Balancing (APLB) mode.</p> <p>Mode 720 = ON:</p> <p>The alternate path of EVA (A/A) is used in the APLB mode.</p> <p>Mode 720 = OFF (default):</p> <p>The alternate path of EVA (A/A) is used in the Single mode.</p> <p>Note:</p> <p>Though online setting is available, the setting will not be enabled until Check Paths is performed for the mapped external device.</p> | OFF | . |
| 721 | Open and Mainframe | <p>When a parity group is uninsulated or installed, the following operation is performed according to the setting of mode 721.</p> <p>Mode 721 = ON:</p> <p>When a parity group is uninstalled or installed, the LED of the drive for uninstallation is not illuminated, and the instruction message for removing the drive does not appear. Also, the windows other than that of parity group, such as DKA or DKU, are unavailable to select.</p> <p>Mode 721 = OFF (default):</p> <p>When a parity group is uninstalled or installed, the operation is as before: the LED of the drive is illuminated, and the drive must be unmounted and remounted.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. When the RAID level or emulation type is changed for the existing parity group, this option should be applied only if the drive mounted position remains the same at the time of the parity group uninstallation or installation. 2. After the operation using this option is completed, the mode must be set back to OFF; otherwise, the LED of the drive to be removed will not be illuminated at subsequent parity group uninstalling operations. | OFF | . |
| 725 part 1 of 2 | External Storage | <p>This option determines the action that will be taken when the status of an external volume is Not Ready</p> <p>Mode 725 = ON:</p> | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|--------------------|-------------------------------------|--|---------|---------|
| | | <p>When Not Ready is returned, the external path is blocked and the path status can be automatically recovered (Not Ready blockade). Note that the two behaviors, automatic recovery and block, may be repeated.</p> <p>For version 60-05-06-00/00 and later, when the status of a device is Not Ready blockade, Device Health Check is executed after 30 seconds.</p> <p>Mode 725 = OFF (default):</p> <p>When Not Ready is returned three times in three minutes, the path is blocked and the path status cannot be automatically recovered (Response error blockade).</p> <p>Notes:</p> <ol style="list-style-type: none"> For R700 70-01-62-00/00 and lower (within 70-01-xx range) <ul style="list-style-type: none"> Applying this SOM is prohibited when USP V/VM is used as an external subsystem and its external volume is DP-VOL. Applying this SOM is recommended when the above condition (1) is not met and SUN storage is used as an external storage. Applying this SOM is recommended if the above condition (1) is not met and a maintenance operation such as firmware update causing controller reboot is executed on the external storage side while a storage system other than Hitachi product is used as an external subsystem. For R700 70-02-xx-00/00 and higher <ul style="list-style-type: none"> Applying this SOM is prohibited when USP V/VM is used as an external subsystem and its external volume is DP-VOL. Applying this SOM is recommended when the above condition (1) is not met and SUN storage is used as an external storage. Applying this SOM is recommended when the above condition (1) is not met and EMC CX series or Fujitsu Fibre CAT CX series is used as an external storage. Applying this SOM is recommended if the above condition (1) is not met and a maintenance operation such as firmware update causing controller reboot is executed on the external storage side while a storage system other than Hitachi product is used as an external subsystem. <p>(Continued below)</p> | | |
| 725 part 2 of 2 | External Storage | <p>Notes: (continued)</p> <ol style="list-style-type: none"> While USP V/VM is used as an external subsystem and its volume is DP-VOL, if SOM e Pool-VOLs constituting the DP-VOL are blocked, external path blockade and recovery occurs repeatedly. When a virtual volume mapped by UVM is set to pool-VOL and used as DP-VOL in local subsystem, this SOM can be applied without problem. | OFF | . |
| 729 | Thin Provisioning Data Retention | <p>To set the Protect attribute for the target DP-VOL using Data Retention (Data Ret), when any write operation is requested to the area where the page allocation is not provided at a time when the HDP Pool is full.</p> <p>Mode 729 = ON:</p> <p>To set the Protect attribute for the target DP-VOL using Data Ret, when any write operation is requested to the area where the</p> | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| | | <p>page allocation is not provided at a time when the HDP pool is full. (Not to set in the case of Read request.)</p> <p>Mode 729 = OFF (default):</p> <p>Not to set the Protect attribute for the target DP-VOL using Data Ret, when any write operation is requested to the area where the page allocation is not provided at a time when HDP pool is full.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This SOM is applied when: <ul style="list-style-type: none"> - The threshold of pool is high (e.g., 95%) and the pool may be full. - File system is used. - Data Retention is installed. 2. Since the Protect attribute is set for V-VOL, the Read operation cannot be allowed as well. 3. When Data Retention is not installed, the desired effect is not achieved. 4. Protect attribute can be released from the Data Retention window of Remote Web Console after releasing the full status of the pool by adding a Pool-VOL. | | |
| 733 | Auto LUN V2, Business Copy, Business Copy Z | <p>This option enables to suspend Volume Migration or Quick Restore operation during LDEV-related maintenance.</p> <p>Mode 733 = ON:</p> <p>Auto LUN V2 or Quick Restore operation during LDEV-related maintenance is not suspended</p> <p>Mode 733 = OFF (default):</p> <p>Auto LUN V2 or Quick Restore operation during LDEV-related maintenance is suspended</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This option should be applied when Auto LUN V2 or Quick Restore operation can be suspended during LDEV-related maintenance. 2. Set mode 733 to ON if you want to perform any LDEV-related maintenance activities and you do not want these operations to fail when Volume Migration or Quick Restore is active. 3. This option is recommended as functional improvement to avoid maintenance failures. In some cases of a failure in LDEV-related maintenance without setting the option, Storage Navigator operations may be unavailable. 4. There is the potential for LDEV-related maintenance activities to fail when Auto LUN V2 and Quick Restore is active without setting the option. | OFF | . |
| 734 | Microcode version V02 and lower: Thin Provisioning Microcode version V02 +1 and higher: Thin Provisioning Dynamic Provisioning for Mainframe | <p>When exceeding the pool threshold, the SIM is reported as follows:</p> <p>Mode 734 = ON: The SIM is reported at the time when exceeding the pool threshold. If the pool usage rate continues to exceed the pool threshold, the SIM is repeatedly reported every eight (8) hours. Once the pool usage rate falls below the pool threshold, and then exceeds again, the SIM is reported.</p> <p>Mode 734 = OFF (default): The SIM is reported at the time when exceeding the pool threshold. The SIM is not reported while the pool usage rate continues to exceed the pool threshold. Once the pool usage rate falls below the pool threshold and then exceeds again, the SIM is reported.</p> <p>Notes:</p> | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|---|---|---------|---------|
| | | <ol style="list-style-type: none"> 1. This option is turned ON to prevent the write I/O operation from being unavailable due to pool full. 2. If the exceeding pool threshold SIM occurs frequently, other SIMs may not be reported. 3. Though turning on this option can increase the warning effect, if measures such as adding a pool fail to be done in time so that the pool becomes full, MODE 729 can be used to prevent file systems from being destroyed. 4. Turning on MODE 741 can provide the SIM report to not only the users but also the service personnel. | | |
| 741 | <p>Microcode version V02 and lower: Thin Provisioning</p> <p>Microcode version V02 +1 and higher: Thin Provisioning, Dynamic Provisioning for Mainframe</p> | <p>The option enables to switch over whether to report the following SIM for users to the service personnel:</p> <p>SIM-RC 625000 (THP pool usage rate continues to exceed the threshold)</p> <p>Mode 741 = ON: SIM is reported to the service personnel</p> <p>Mode 741 = OFF (default): SIM is not reported to the service personnel</p> <p>Note:</p> <ol style="list-style-type: none"> 1. This option is set to ON to have SIM for users reported to the service personnel: <ul style="list-style-type: none"> - For the system where SNMP and E-mail notification are not set. - If Remote Web Console is not periodically activated. 2. When MODE 734 is turned OFF, SIM-RC625000 is not reported; accordingly the SIM is not reported to the service personnel even though this option is ON. | OFF | - |
| 745 | External Storage | <p>Enables to change the area where the information is obtained as the Characteristic1 item from SYMMETRIX.</p> <p>Mode 745 = ON:</p> <ul style="list-style-type: none"> • The area where the information is obtained as the Characteristic1 item from SYMMETRIX is changed. • When CheckPaths or Device Health Check (1/hour) is performed, the information of an already-mapped external volume is updated to the one after change. <p>Mode 745 = OFF (default):</p> <ul style="list-style-type: none"> • The area where the information is obtained as the Characteristic1 item from SYMMETRIX is set to the default. • When CheckPaths or Device Health Check (1/hour) is performed, the information of an already-mapped external volume is updated to the default. <p>Notes:</p> <ol style="list-style-type: none"> 1. This option is applied when the Characteristic1 item is displayed in symbols while the EMC SYMMETRIX is connected using UVM. 2. Enable the setting of EMC SCSI Flag SC3 for the port of the SYMMETRIX connected with P9500. If the setting of EMC SCSI Flag SC3 is not enabled, the effect of this mode may not be achieved. 3. If you want to enable this mode immediately after setting, perform Check Paths on each path one by one for all the external ports connected to the SYMMETRIX. Without doing Check Paths, the display of Characteristic1 can be changed automatically by the Device Health Check performed once | OFF | - |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---|
| | | <p>per hour. If SSB=AD02 occurs and a path is blocked, perform Check Paths on this path again.</p> <p>4. If Check Paths is performed while Business Copy Z pair and Compatible FlashCopy Mirror pair are defined in the specified volume, the Check Paths operation is rejected with a message "605 2518". If Business Copy Z pair and Compatible FlashCopy Mirror pair are defined in the specified volume, do not perform Check Paths and wait until the display is automatically changed.</p> | | |
| 749 | <p>Microcode version V02 and lower: Thin Provisioning, Smart Tiers</p> <p>Microcode version V02_ICS or V02+1: Thin Provisioning Dynamic Provisioning for Mainframe Smart Tiers</p> <p>Microcode version V03 and higher: Thin Provisioning Dynamic Provisioning for Mainframe Smart Tiers Smart Tiers Z</p> | <p>Disables the Thin Provisioning Rebalance function that allows the HDDs of all ECC Groups in the pool to share the load.</p> <p>Mode 749 = ON: The Thin Provisioning Rebalance function is disabled.</p> <p>Mode 749 = OFF (default): The Thin Provisioning Rebalance function is activated.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This option is applied when no change in performance characteristic is desired. 2. All THP pools are subject to the THP Rebalance function. 3. When a pool is newly installed, the load may be concentrated on the installed pool volumes. 4. When 0 data discarding is executed, load may be unbalanced among pool volumes. | OFF | . |
| 757 | Open and Mainframe | <p>Enables/disables output of in-band audit logs.</p> <p>Mode 757 = ON: Output is disabled.</p> <p>Mode 757 = OFF (default): Output is enabled.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Mode 757 applies to the sites where outputting the In-band audit logs is not needed. 2. When this option is set to ON <ul style="list-style-type: none"> - There is no access to SM for the In-band audit logs, which can avoid the corresponding performance degradation. - SM is not used for the In-band audit logs. 3. If outputting the In-band audit log is desired, set this mode to OFF. | OFF | MCU/RCU |
| 762 | Continuous Access Journal Z | <p>This mode enables to settle the data to RCU according to the time stamp specified in the command when a Flush suspension for an EXCTG is performed from BCM.</p> <p>Mode 762 = ON: The data is settled to RCU according to the time stamp specified in the command.</p> <p>Mode 762 = OFF (default):</p> | OFF | RCU (On RCU side, consideration in Takeover is required for setting) |

Table 11 System option modes (continued)

| Mode | Category | Description | Default | MCU/RCU |
|------|--|---|---------|-------------|
| | | <p>The data is settled to RCU according to the time stamp that RCU has received.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied under the following conditions. (1)Continuous Access Journal Z. (2) EXCTG configuration. (3) Flush suspension with an EXCTG specified is executed. (4) BCM is installed on the host where the time stamping function is available. (In the case of multiple-host configuration, SYSPLEX timer is available on the system) 2. If this mode is set to ON while the BCM does not exist in the environment where the time stamping function is available (In the case of multiple-host configuration, SYSPLEX timer is available on the system), the pair status may not become Suspend after Flush suspension for an EXCTG. 3. Do not set this mode to ON if the BCM does not exist in the environment where the time stamping function is available (In the case of multiple-host configuration, SYSPLEX timer is available on the system). | | |
| 769 | Continuous Access Synchronous Continuous Access Synchronous Z Continuous Access Journal Continuous Access Journal Z | <p>This mode controls whether the retry operation is executed or not when a path creation operation is executed.</p> <p>(The function applies to both of CU FREE path and CU single path for Open and Mainframe).</p> <p>Mode 769 = ON:</p> <p>The retry operation is disabled when the path creation operation is executed (retry operation is not executed).</p> <p>Mode 769 = OFF (default):</p> <p>The retry operation is enabled when the path creation operation is executed (retry operation is executed).</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied when the three conditions below are met: <ul style="list-style-type: none"> • SOM 114 is set to OFF (operation of automatically switching the port is disabled). • HMO 49 and HMO 50 are set to OFF (70-02-31-00/00 and higher). • TPC-R is used (it is not applied in normal operation). 2. When SOM 769 is set to ON, SOM 114, HMO 49 and HMO 50 must not be set to ON. 3. In either of the following cases, the path creating operation may fail after automatic port switching is executed. <ul style="list-style-type: none"> • SOM 114 is set to ON. • HMO 49 and HMO 50 are set to ON. | OFF | MCU and RCU |
| 776 | Continuous Access Synchronous Z, Business Continuity Manager | <p>This mode enables/disables to output the F/M=FB message to the host when the status of P-VOL changes to Suspend during a TC/TCA S-VOL pair suspend or deletion operation from BCM.</p> <p>Mode 776 = ON:</p> <p>When the status of P-VOL changes to Suspend during a TC/TCA S-VOL pair suspend or deletion operation from BCM, the F/M=FB message is not output to the host.</p> | OFF | . |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|---------------|--|--|---------|---------|
| | | <p>Mode 776 = OFF (default):</p> <p>When the status of P-VOL changes to Suspend during a TC/TCA S-VOL pair suspend or deletion operation from BCM, the F/M=FB message is output to the host.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Set this mode to ON in the environment where TC/TCA for z/OS is used from BCM and the MCU host does not need the F/M=FB message output during an S-VOL pair suspend or deletion operation from BCM. 2. If this mode is set to ON, the F/M=FB message is not output to the host when the status of P-VOL changes to Suspend during a TC/TCA S-VOL pair suspend or deletion operation from BCM 3. If the PPRC item of CU option is set to NO, the F/M=FB message is not output to the host regardless of setting of this mode. 4. If the function switch#07 is set to "enable", the F/M=FB message is not output to the host regardless of setting of this mode. | | |
| 784 1 of 2 | Continuous Access Synchronous Continuous Access Synchronous for Mainframe | <p>This mode can reduce the MIH watch time of RI/O for a Continuous Access Synchronous for MainframeS or Continuous Access Synchronous pair internally so that update I/Os can continue by using an alternate path without MIH or time-out occurrence in the environment where Mainframe host MIH is set to 15 seconds, or Open host time-out time is short (15 seconds or less). The mode is effective at initial pair creation or Resync operation for Continuous Access Synchronous Z or Continuous Access Synchronous. (Not effective by just setting this mode to ON)</p> <p>Mode 784 = OFF (default):</p> <p>The operation is processed in accordance with the TC Sync for z/OS or TC Sync specification.</p> <p>Special Direction</p> <ul style="list-style-type: none"> • (1) The mode is applied to the environment where Mainframe host MIH time is set to 15 seconds. • (2) The mode is applied to the environment where OPEN host time-out time is set to 15 seconds or less. • (3) The mode is applied to reduce RI/O MIH time to 5 seconds. • (4) The mode is effective for the entire system. <p>Notes:</p> <ol style="list-style-type: none"> 1. This function is available for all the TC Sync for z/OS and TC Sync pairs on the subsystem, unable to specify the pairs that are using this function or not. 2. RAID700) To apply the mode to TC Sync, both MCU and RCU must be RAID700 and micro-program must be the support version on both sides. If either one of MCU or RCU is RAID600, the function cannot be applied. 3. For a TC Sync for z/OS or TC Sync pair with the mode effective (RI/O MIH time is 5 seconds), the setting of RI/O MIH time made at RCU registration (default is 15 seconds, which can be changed within range from 10 to 100 seconds) is invalid. However, RI/O MIH time displayed on Storage Navigator and CCI is not "5 seconds" but is what set at RI/O registration. | OFF | MCU/RCU |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|---------------|--|---|---------|---------|
| | | <p>4. To apply the mode to TC Sync for z/OS, MCU and RCU must be RAID600 or RAID700 and micro-program must be the support version on both sides.</p> <p>5. If a failure occurs on the switched path between DKCs, Mainframe host MIH or Open server time-out may occur.</p> <p>(Continued below)</p> | | |
| 784 2 of 2 | Continuous Access Synchronous Continuous Access Synchronous for Mainframe | <p>Notes: (continued)</p> <p>6. If an MP to which the path between DKCs belongs is overloaded, switching to an alternate path delays and host MIH or time-out may occur.</p> <p>7. If an RI/O retry occurs due to other factors than RI/O MIH (5 sec), such as a check condition report issued from RCU to MCU, the RI/O retry is performed on the same path instead of an alternate path. If a response delay to the RI/O occurs constantly on this path due to path failure or link delay, host MIH or time-out may occur due to response time accumulation for each RI/O retried within 5 seconds.</p> <p>8. Even though the mode is set to ON, if Mainframe host MIH time or Open host time-out time is set to 10 seconds or less, host MIH or time-out may occur due to a path failure between DKCs.</p> <p>9. Operation commands are not available for promptly switching to an alternate path.</p> <p>10. The mode works for the pair for which initial pair creation or Resync operation is executed.</p> <p>11. Micro-program downgrade to an unsupported version cannot be executed unless all the TC Sync for z/OS or TC Sync pairs are suspended or deleted.</p> <p>12. See the appendix of the SOM for operational specifications in each combination of MCU and RCU.</p> | OFF | MCU/RCU |
| 787 | Compatible FlashCopy | <p>This mode enables the batch prefetch copy.</p> <p>Mode 787 = ON: The batch prefetch copy is executed for an FC Z pair and a Preserve Mirror pair</p> <p>Mode 787 = OFF (default): The batch prefetch copy is not executed.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. When the mode is set to ON, the performance characteristic regarding sequential I/Os to the FCv2target VOL changes. 2. The mode is applied only when SOM 577 is set to OFF 3. The mode is applied if response performance for a host I/O issued to the FCv2 target VOL is prioritized | OFF | .. |
| 803 | Dynamic Provisioning, Data Retention Utility | <p>While a THP pool VOL is blocked, if a read or write I/O is issued to the blocked pool VOL, this mode can enable the Protect attribute of DRU for the target DP-VOL.</p> <p>Mode 803 = ON: While a THP pool VOL is blocked, if a read or write I/O is issued to the blocked pool VOL, the DRU attribute is set to Protect.</p> <p>Mode 803 = OFF (default): While a THP pool VOL is blocked, if a read or write I/O is issued to the blocked pool VOL, the DRU attribute is not set to Protect.</p> <p>Notes:</p> | OFF | .. |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| | | <ol style="list-style-type: none"> 1. This mode is applied when <ul style="list-style-type: none"> - a file system using THP pool VOLs is used. - Data Retention Utility is installed. 2. Because the DRU attribute is set to Protect for the V-VOL, a read I/O is also disabled. 3. If Data Retention Utility is not installed, the expected effect cannot be achieved. 4. The Protect attribute of DRU for the HDP V-VOL can be released on the Data Retention window of Storage Navigator after recovering the blocked pool VOL. | | |
| 855 | Business Copy/Snapshot, ShadowImage for Mainframe, Auto LUN V2 | <p>By switching the mode to ON/OFF when Business Copy/Snapshot is used with SOM 467 set to ON, copy processing is continued or stopped as follows.</p> <p>Mode 855 = ON:</p> <p>When the amount of dirty data is within the range from 58% to 63%, the next copy processing is continued after the dirty data created in the previous copy is cleared to prevent the amount of dirty data from increasing (copy after destaging). If the amount of dirty data exceeds 63%, the copy processing is stopped.</p> <p>Mode 855 = OFF (default):</p> <p>The copy processing is stopped when the amount of dirty data is over 60%.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied when all the following conditions are met <ul style="list-style-type: none"> • ShadowImage is used with SOM 467 set to ON. • Write pending rate of an MP blade that has LDEV ownership of the copy target is high • Usage rate of a parity group to which the copy target LDEV belongs is low. • ShadowImage copy progress is delayed. 2. This mode is available only when SOM 467 is set to ON. 3. If the workload of the copy target parity group is high, the copy processing may not be improved even if this mode is set to ON | | |
| 857 | OPEN and Mainframe | <p>This mode enables or disables to limit the cache allocation capacity per MPB to within 128 GB except for cache residency.</p> <p>Mode 857 = ON:</p> <p>The cache allocation capacity is limited to within 128 GB.</p> <p>Mode 857 = OFF (default):</p> <p>The cache allocation capacity is not limited to within 128 GB.</p> <p>Note:</p> <p>This mode is used with P9500 microcode version -04 (70-04-0x-00/00) and earlier. It is also applied when downgrading the microprogram from V02 (70-02-02-00/00) or higher to a version earlier than V02 (70-02-02-00/00) while over 128 GB is allocated.</p> | OFF | - |
| 867 | Dynamic Provisioning | <p>All-page reclamation (discarding all mapping information between THP pool and THP volumes) is executed in DP-VOL LDEV format. This new method is enabled or disabled by setting the mode to ON or OFF.</p> <p>Mode 867 = ON:</p> | OFF | .. |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|---------------------------------|--|---------|---------|
| | | <p>LDEV format of the DP-VOL is performed with page reclamation.</p> <p>Mode 867 = OFF (default):LDEV format of the HDP-VOL is performed with 0 data writing.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied at recovery after a pool failure. 2. Do not change the setting of the mode during DP-VOL format. 3. If the setting of the mode is changed during DP-VOL format, the change is not reflected to the format of the DP-VOL being executed but the format continues in the same method. | | |
| 872 | External Storage | <p>When the mode is applied, the order of data transfer slots is guaranteed at the destaging from P9500 to an external storage.</p> <p>Mode 872 = ON:</p> <p>The order of data transfer slots from P9500 to an external storage is guaranteed.</p> <p>Mode 872 = OFF (default):</p> <p>The order of data transfer slots from P9500 to an external storage is not guaranteed.</p> <p>In V03 and later versions, the mode is set to ON before shipment.</p> <p>If the micro-program is exchanged to a supported version (V03 or later), the setting is OFF as default and needs to be set to ON manually.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. This mode is applied when performance improvement at sequential write in UVM configuration is required. | OFF | .. |
| 894 | Mainframe | <p>By disabling context switch during data transfer, response time in low I/O load is improved.</p> <p>Mode 894 = ON:</p> <p>When all the following conditions are met, the context switch is disabled during data transfer.</p> <ol style="list-style-type: none"> 1. The average MP operating rate of MP PCB is less than 40 %, or the MP operating rate is less than 50%. 2. Write pending rate is less than 35 %. 3. Data transfer length is within 8 KB. 4. The time from job initiation is within 1600 ?s <p>Mode 894 = OFF (default):</p> <p>The context switch is enabled during data transfer.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied when improvement of I/O response performance in low workload is required. 2. Because the processing on the Mainframe target port is prioritized, other processing may take longer time compared to that when the mode is set to OFF. | OFF | |
| 895 | Continuous Access Synchronous Z | <p>Setting the mode to ON or OFF, the link type with transfer speed of 8 GBps or 4 GBps is reported respectively.</p> <p>Mode 895 = ON:</p> <p>When the FICON/FC link up speed is 8 GBps, the link type with transfer speed of 8 GBps is reported.</p> <p>Mode 895 = OFF (default):</p> <p>The link type with transfer speed of up to 4 GBps is reported , even when the actual transfer speed is 8 GBps.</p> | OFF | .. |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| | | Notes: <ol style="list-style-type: none"> 1. To apply the mode, set the RMF version of mainframe to be connected to 1.12 or higher. 2. If the OS does not use a supported version, the transfer speed cannot be displayed correctly. | | |
| 896 | Thin Provisioning Thin Provisioning Z, Smart Tiers Smart Tiers Z, Fast Snap | <p>The mode enables or disables the background format function performed on an unformatted area of a THP/Smart pool.</p> <p>For the information of operating conditions, refer to Provisioning Guide for Open Systems or Provisioning Guide for Mainframe Systems.</p> <p>Mode 896 = ON: The background format function is enabled.</p> <p>Mode 896 = OFF (default): The background format function is disabled.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. The mode is applied when a customer requires the background format for a DP/Smart pool in the environment where new page allocation (for example, when system files are created from a host for newly created multiple THP VOLs), frequently occurs and the write performance degrades because of an increase in write pending rate. 2. When the mode is set to ON, because up to 42MB/s of ECCG performance is used, local copy performance may degrade by about 10%. Therefore, confirm whether the 10% performance degradation is acceptable or not before setting the mode to ON. 3. When a Dynamic Provisioning VOL that is used as an external VOL is used as a pool VOL, if the external pool becomes full due to the background format, the external VOL may be blocked. <p>If the external pool capacity is smaller than the external VOL (Dynamic Provisioning VOL), do not set the mode to ON.</p> | OFF | .. |
| 897 | Smart Tiers, Smart Tiers Z | <p>By the combination of SOM 897 and 898 setting, the expansion width of Tier Range upper I/O value (IOPH) can be changed as follows.</p> <p>Mode 897 = ON: SOM 898 is OFF: 110%+0IO SOM 898 is ON: 110%+2IO</p> <p>Mode 897 = OFF (Default) SOM 898 is OFF: 110%+5IO (Default) SOM 898 is ON: 110%+1IO</p> <p>By setting the SOM s to ON to lower the upper limit for each tier, the gray zone between other tiers becomes narrow and the frequency of page allocation increases.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Apply the mode when the usage of upper tier is low and that of lower tier is high. 2. The mode must be used with SOM 898. 3. Narrowing the gray zone increases the number of pages to migrate between tiers per relocation. 4. When Tier1 is SSD while SOM 901 is set to ON, the effect of SOM 897 and 898 to the gray zone of Tire1 and Tier2 is disabled and the SOM 901 setting is enabled instead. In | OFF | .. |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|----------------------------|--|---------|---------|
| | | <p>addition, the settings of SOM 897 and 898 are effective for Tire2 and Tier3.</p> <p>Please also see spreadsheet "SOM 897_898_901" for more details about the relations between SOM 897, 898 and 901.</p> | | |
| 898 | Smart Tiers, Smart Tiers Z | <p>I/O value (IOPH) can be changed as follows.</p> <p>Mode 898 = ON:</p> <p>SOM 897 is OFF: 110%+1IO SOM 897 is ON: 110%+2IO</p> <p>Mode 898 = OFF (default):</p> <p>SOM 897 is OFF: 110%+5IO (Default) SOM 897 is ON: 110%+0IO</p> <p>By setting the SOM s to ON to lower the upper limit for each tier, the gray zone between other tiers becomes narrow and the frequency of page allocation increases.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Apply the mode when the usage of upper tier is low and that of lower tier is high. 2. The mode must be used with SOM 897. 3. Narrowing the gray zone increases the number of pages to migrate between tiers per relocation. 4. When Tier1 is SSD while SOM 901 is set to ON, the effect of SOM 897 and 898 to the gray zone of Tire1 and Tier2 is disabled and the SOM 901 setting is enabled instead. In addition, the settings of SOM 897 and 898 are effective for Tire2 and Tier3. <p>Please also see spreadsheet "SOM 897_898_901" for more details about the relations between SOM 897, 898 and 901.</p> | OFF | .. |
| 899 | Volume Migration | <p>In combination with the SOM 900 setting, whether to execute and when to start the I/O synchronous copy change as follows.</p> <p>Mode 899 = ON:</p> <p>SOM 900 is ON: I/O synchronous copy starts without retrying Volume Migration. SOM 900 is OFF: I/O synchronous copy starts when the threshold of Volume Migration retry is exceeded. (Recommended)</p> <p>Mode 899 = OFF (default):</p> <p>asSOM 900 is ON: I/O synchronous copy starts when the number of retries reaches half of the threshold of Volume Migration retry. SOM 900 is OFF: Volume Migration is retired and I/O synchronous copy is not executed.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied when improvement of Volume Migration success rate is desired under the condition that there are many updates to a migration source volume of Volume Migration. 2. During I/O synchronous copy, host I/O performance degrades. | OFF | .. |
| 900 | Auto LUN | <p>In combination with SOM899 setting, whether to execute and when to start the I/O synchronous copy change as follows.</p> <p>Mode 900 = ON:</p> <p>SOM899 is ON: I/O synchronous copy starts when the threshold of Auto LUN retry is exceeded.</p> | OFF | |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|------------------------------|---|---------|---------|
| | | <p>SOM899 is OFF: I/O synchronous copy starts when the number of retries reaches half of the threshold of Auto LUN retry.</p> <p>Mode 900 = OFF (default):</p> <p>SOM899 is ON: I/O synchronous copy starts when the threshold of Volume Migration retry is exceeded. (Recommended)</p> <p>SOM899 is OFF: Volume Migration is retired and I/O synchronous copy is not executed.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. This mode is applied when improvement of Auto LUN success rate is desired under the condition that there are many updates to a migration source volume of Auto LUN. 2. During I/O synchronous copy, host I/O performance degrades. | | |
| 901 | Smart Tiers Smart Tiers Z | <p>By setting the mode to ON or OFF, the page allocation method of Tier Level ALL when the drive type of tier1 is SSD changes as follows.</p> <p>Mode 901 = ON:</p> <p>For tier1 (drive type is SSD), pages are allocated until the capacity reaches the limit. Without consideration of performance limitation exceedance, allocation is done from highly loaded pages until reaching the capacity limit</p> <p>When the capacity of the tier1 reaches the threshold value, the minimum value of the tier range is set to the starting value of the lower IOPH zone, and the maximum value of the lower tier range is set to the boundary value.</p> <p>Mode 901 = OFF (default):</p> <p>For tier1 (drive type is SSD), page allocation is performed based on performance potential limitation. With consideration of performance limitation exceedance, allocation is done from highly loaded pages but at the point when the performance limitation is reached, pages are not allocated any more even there is free space.</p> <p>When the capacity of the tier1 reaches the threshold value, the minimum value of the tier range is set to the boundary value, and the maximum value of the lower tier range is set to a value of boundary value x 110% + 5 [IOPH].</p> | OFF | |
| 904 | Smart Tiers Smart Tiers Z | <p>By setting the mode to ON or OFF, the number of pages to be migrated per unit time at tier relocation is changed.</p> <p>Mode 904 = ON:</p> <p>The number of pages to be migrated at tier relocation is set to up to one page per second. Mode 904 = OFF (default):</p> <p>No restriction on the number of pages to be migrated at tier relocation (existing specification).</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This mode is applied when: <ul style="list-style-type: none"> • Smart Tiers Z is used (including multi platforms configuration). • the requirement for response time is severe. 2. The number of pages to be migrated per unit time at tier relocation decreases. | OFF | . |
| 908 | Continuous Access Journal | <p>The mode can change CM capacity allocated to MPBs with different workloads.</p> <p>Mode 908 = ON:</p> | OFF | . |

Table 11 System option modes (continued)

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| | Continuous Access Journal Z | <p>The difference in CM allocation capacity among MPBs with different workload is large.</p> <p>Mode 908 = OFF (default):</p> <p>The difference in CM allocation capacity among MPBs with different workload is small (existing operation)</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. The mode is applied to a CLPR only used for UR JNLGs. 2. Since CM capacity allocated to MPBs with low load is small, the performance is affected by a sudden increase in load. | | |
| 912 | Smart Tiers Smart Tiers Z | <p>When the mode is set to ON, Smart monitoring information of a THP pool containing a THP VOL to which the per-page policy setting is made is discarded</p> <p>One hour or more is required from the time when the mode is set to on to the time when the discarding processing is completed. In addition, the per-page policy setting is prevented while the mode is ON.</p> <p>Mode 912 = ON:</p> <p>Smart monitoring information of a THP pool containing a THP VOL to which the per-page policy setting is made is discarded. The following restrictions are applied to the THP pool.</p> <ol style="list-style-type: none"> 1. When execution mode is Auto, monitoring the target THP pool is disabled. 2. When execution mode is Manual, a request to start monitoring the target THP pool is not accepted. 3. Monitoring information (weighted average information) of the target THP pool is discarded. <p>Mode 912 = OFF (default):</p> <p>Smart monitoring information of a THP pool containing a THP VOL to which the per-page policy setting is made is not discarded.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. The mode is applied when the micro-program is downgraded from V04 or higher to earlier than V04 while the per-page policy setting has been made once. (including a case that the per-page policy setting is once made and then released.) 2. After setting the mode to ON, wait for one hour or more until the discarding processing is completed. | | |
| 917 | Thin Provisioning Thin Provisioning Z Smart Tiers Smart Tiers Z | <p>The mode is used to switch the method to migrate data at rebalancing.</p> <p>Mode 917 = ON (default):</p> <p>Page usage rate is averaged among parity groups or external volume groups where pool volumes are defined.</p> <p>Mode 917 = OFF:</p> <p>Page usage rate is averaged among pool volumes without considering parity groups or external volume groups.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. The mode is applied when multiple LDEVs are created in a parity group or external volume group. 2. If the mode setting is changed during pool shrink, the shrink processing may fail. 3. When the mode is set to OFF, the processing to average page usage rate among pool volumes in a parity group or external volume group works; therefore, the drive workload becomes | ON | |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|--|--|---------|---------|
| | | <p>high because the migration source and target are in the same parity group or external volume group.</p> <p>4. When pool shrink is performed per pool VOL from a parity group with multiple pool VOLs defined (or from an external volume group) while the mode is set to ON, the pool shrink takes longer time compared to when the mode is set to OFF.</p> | | |
| 930 | Thin Provisioning Fast Snap | <p>When the mode is set to ON, all of the zero data page reclamation operations in processing are stopped. (Also the zero data page reclamation cannot be started.)</p> <p>* Zero data page reclamation by WriteSame and UNMAP functions, and IO synchronous page reclamation are not disabled.</p> <p>Mode 930 = ON:</p> <p>All of the zero data page reclamation operations in processing are stopped at once. (Also the zero data reclamation cannot be newly started.)</p> <p>Mode 930 = OFF (default):</p> <p>The zero data page reclamation is performed.</p> <p>See sheet "SOM 930" for relationship with SOM 755 and SOM 859.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. The mode is applied when stopping or disabling zero data page reclamation by user request is required. 2. When the mode is set to ON, the zero data page reclamation does not work at all. <ul style="list-style-type: none"> • Zero data page reclamation by Write Same and UNMAP, and IO synchronous page reclamation can work. 3. When downgrading micro-program to a version that does not support the mode while the mode is set to ON, set the mode to OFF after the downgrade <ul style="list-style-type: none"> • Because the zero data page reclamation does not work at all while the mode is set to ON. 4. The mode is related to SOM 755 and SOM 859. | | |
| 937 | Thin Provisioning Thin Provisioning Z Smart Tiers Smart Tiers Z | <p>By setting the mode to ON, Smart monitoring data is collected even if the pool is a THP pool.</p> <p>Mode 937 = ON:</p> <p>Smart monitoring data is collected even if the pool is a THP pool. Only Manual execution mode and Period mode are supported.</p> <p>Mode 937 = OFF (default):</p> <p>Smart monitoring data is not collected if the pool is a THP pool</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. The mode is applied when Smart monitoring data collection is required in THP environment. 2. When Smart is already used, do not set the mode to ON. 3. For Smart monitoring data collection, shared memory for Smart must be installed. 4. If monitoring data collection is performed without shared memory for Smart installed, an error is reported and the monitoring data collection fails. 5. Before removeing the shared memory for Smart, set the mode to OFF and wait for 30 minutes. | | |

Table 11 System option modes *(continued)*

| Mode | Category | Description | Default | MCU/RCU |
|------|----------|---|---------|---------|
| | | <p>6. Tier relocation with monitoring data collected when the mode is set to ON is disabled.</p> <p>7. When THP is converted into Smart (after purchase of PP license), the collected monitoring data is discarded.</p> | | |

Table 12 Mode 269: Remote Web Console operations

| Operation | Target of Operation | Mode 269 ON | Mode 269 OFF |
|-----------|---------------------|--------------|--------------|
| VLL (CVS) | All LDEVs in a PG | No format | No format |
| VLL (CVS) | Some LDEVs in a PG | No format | No format |
| Format | PG is specified | No operation | No operation |
| Format | All LDEVs in a PG | Low speed | Low speed |
| Format | Some LDEVs in a PG | Low speed | Low speed |

Table 13 Mode 269: SVP operations

| Operation | Target of Operation | Mode 269 ON | Mode 269 OFF |
|---------------|---------------------|-------------|--------------|
| PDEV Addition | - | High speed | High speed |
| VLL (CVS) | All LDEVs in a PG | No format | No format |
| VLL (CVS) | Some LDEVs in a PG | No format | No format |
| Format | PG is specified | High speed | High speed |
| Format | All LDEVs in a PG | High speed | Low speed |
| Format | Some LDEVs in a PG | Low speed | Low speed |
| PDEV Addition | - | High speed | High speed |

Host modes and host mode options

The P9500 supports connection of multiple server hosts of different platforms to each of its ports. When your system is configured, the hosts connected to each port are grouped by host group or by target. For example, if Solaris and Windows hosts are connected to a fibre port, a host group is created for the Solaris hosts, another host group is created for the Windows hosts, and the appropriate host mode and host mode options are assigned to each host group. The host modes and host mode options provide enhanced compatibility with supported platforms and environments.

The host groups, host modes, and host mode options are configured using the LUN Manager software on Remote Web Console. For further information on host groups, host modes, and host mode options, see the *HP XP P9000 Provisioning for Open Systems User Guide*.

Open systems operations

This section provides high-level descriptions of OPEN systems compatibility, support, and configuration.

Open systems compatibility and functionality

The P9500 supports and offers many features and functions for the open-systems environment, including:

- Multi-initiator I/O configurations in which multiple host systems are attached to the same fibre-channel interface
- Fibre-channel arbitrated-loop (FC-AL) and fabric topologies
- Command tag queuing
- Industry-standard failover and logical volume management software
- SNMP remote disk array management

The P9500's global cache enables any fibre-channel port to have access to any logical unit in the disk array. In the P9500, each logical unit can be assigned to multiple fibre-channel ports to provide I/O path failover and/or load balancing (with the appropriate middleware support) without sacrificing cache coherency.

The user should plan for path failover (alternate pathing) to ensure the highest data availability. The logical units can be mapped for access from multiple ports and/or multiple target IDs. The number of connected hosts is limited only by the number of FC ports installed and the requirement for alternate pathing within each host. If possible, the primary path and alternate paths should be attached to different channel cards.

Open systems host platform support

The P9500 disk array supports most major open-system operating systems, such as Microsoft Windows, Oracle Solaris, IBM AIX, Linux, HP-UX, and VMware. For more complete information on the supported operating systems, go to: <http://www.hp.com>. Each supported platform has a user guide that is included in the P9500 documentation set. See the *HP XP P9000 Documentation Roadmap* for a complete list of P9500 user guides, including the host configuration guides.

Open systems configuration

After physical installation of the P9500 disk array has been completed, the user configures the disk array for open-systems operations with assistance as needed from the HP representative.

Please see the following documents for information and instructions on configuring your P9500 disk array for open-systems operations:

- The host configuration guides provide information and instructions on configuring the P9500 disk array and disk devices for attachment to the open-systems hosts.

NOTE: Queue depth and other parameters may need to be adjusted for the disk array. See the appropriate configuration guide for queue depth and other requirements.

- The *HP XP P9000 Remote Web Console User Guide* provides instructions for installing, configuring, and using Remote Web Console to perform resource and data management operations on the P9500 disk array.
- The *HP XP P9000 Provisioning for Open Systems User Guide* describes and provides instructions for configuring the P9500 for host operations, including FC port configuration, LUN mapping, host groups, host modes and host mode options, and LUN Security.

Each fibre-channel port on the P9500 disk array provides addressing capabilities for up to 2,048 LUNs across as many as 255 host groups, each with its own LUN 0, host mode, and host mode options. Multiple host groups are supported using LUN Security.

- The *HP XP P9000 SNMP Agent User Guide* describes the SNMP API interface for the P9500 disk array and provides instructions for configuring and performing SNMP operations.
- The *HP XP P9000 Provisioning for Open Systems User Guide* and *HP XP P9000 Volume Shredder for Open and Mainframe Systems User Guide* provide instructions for configuring multiple custom volumes (logical units) under single LDEVs on the P9500 disk array. The *HP XP P9000 Provisioning for Open Systems User Guide* also provides instructions for configuring size-expanded logical units by concatenating multiple logical units to form individual large logical units.

Remote Web Console

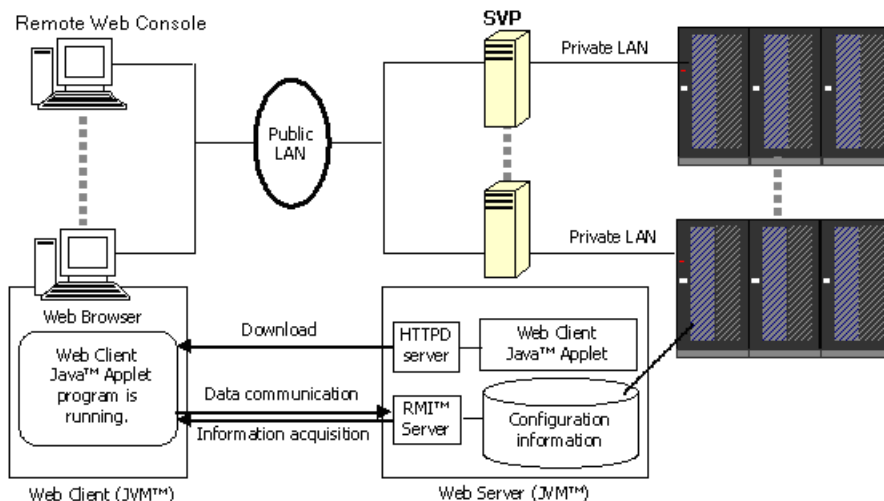
Remote Web Console is installed on a PC, laptop, or workstation. It communicates via a LAN to the SVP in the P9500 disk array. The SVP obtains disk array configuration and status information and sends user initiated commands to the disk array. The Remote Web Console GUI displays detailed disk array information and allows users to configure and perform storage operations on the system.

Remote Web Console is provided as a Java applet program that can be executed on any machine that supports a Java Virtual Machine (JVM). A PC hosting the Remote Web Console software is called a remote console. Each time a remote console accesses and logs into the SVP of the desired disk array, the Remote Web Console applet is downloaded from the SVP to the remote console.

[Figure 10 \(page 53\)](#) illustrates remote console and SVP configuration for Remote Web Console.

For further information about Remote Web Console, see the *HP XP P9000 Remote Web Console User Guide*.

Figure 10 Remote Web Console and SVP configuration



3 System components

Controller chassis

The controller chassis provides system logic, control, memory, and monitoring, as well as the interfaces and connections to the disk drives and the host servers. The controller chassis consists of the following components:

Table 14 Controller chassis

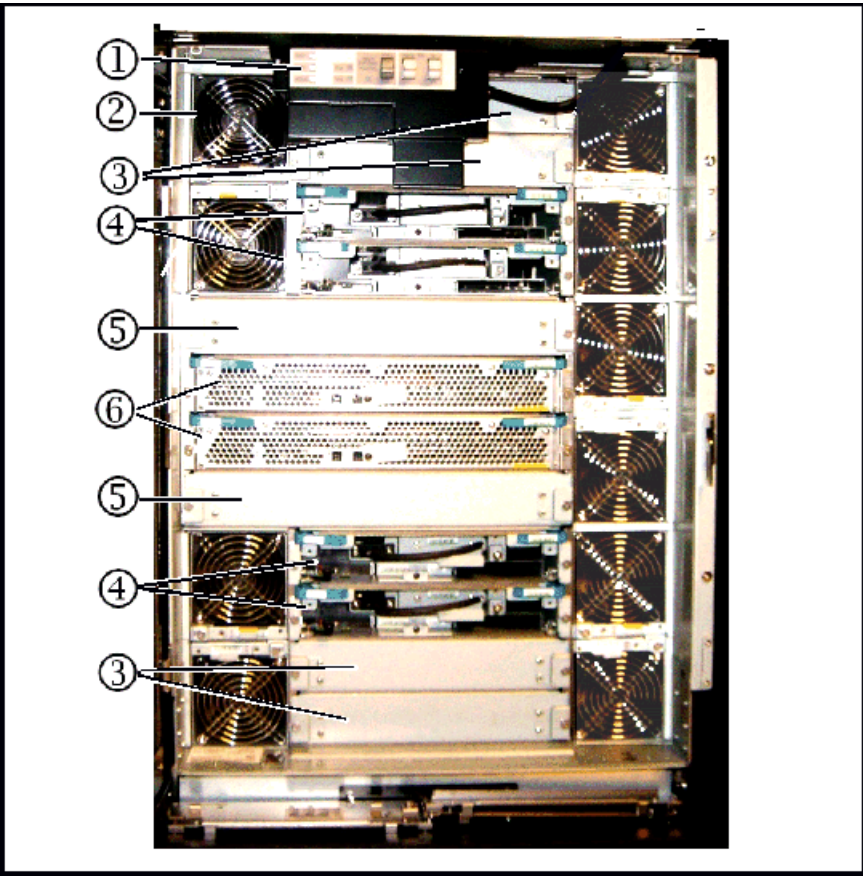
| Item | | | Description |
|----------------------------|-----------------------------------|--|--|
| Name | Min | Max | . |
| CHA | 2 | 8 if 4 DKAs installed. 12 if no DKAs installed. | A CHA is an interface board that provides connection to the host servers. It provides the channel interface control functions and intercache data transfer functions between the disk array and the host servers. It converts the data format between CKD and FBA. The CHA contains an internal processor and 128 bytes of edit buffer memory. |
| DKA | 0 with no drives 2 with drives | 4 | A DKA is an interface board that provides connection to the disk drives and SSDs. Provides the control functions for data transfer between drives and cache. The DKA contains DRR (Data Recover and Reconstruct), a parity generator circuit. It supports eight FIBRE path and offers 32 KB of buffer for each FIBRE path. |
| Switches | 2 | 4 | The full duplex switches serve as the data interconnection between the CHAs, DKAs, and cache memory. They also connect the control signals between the Micro Processor Blade (microprocessors) and the cache memory. |
| Service processor (SVP) | 1 | 2 | A custom PC that implements system configuration settings and monitors the system operational status. Connecting the SVP to service center enables the storage system to be remotely monitored and maintained by the HP support team. This significantly increases the level of support that HP can provide to its customers. NOTE: The SVP also provides a communication hub for the 3rd and 4th Processor blade in Module-0. The SVP is installed only in Module-0 only (system 0). In a system with two SVPs, both are installed in the controller chassis in system 0 |
| Hub | 1 | 2 | Connects the switches, adapters, and service processor. NOTE: The Hub provides communication connection for 3rd and 4th Processor blade in Module-0. The Hub is installed in Module-1 only. |
| ESW | 2 | 4 | The full duplex switches serve as the data interconnection between the CHAs, DKAs, and CMs. They also connect the control signals between the P9500s (microprocessors) and the CM boards. |
| Processor Blades | 2 | 4 | Quad core, 2.33 GHz processors are independent of the CHAs and DKAs and can be shared across CHAs and DKAs |
| Cache memory adapter (CPC) | 2 | 4 | The cache is an intermediate buffer between the channels and drives. Each cache memory adapter has a maximum capacity of 32 GB. An environmentally friendly nickel hydride battery and up to two Cache Backup Memory Solid States Disk drives are installed on each Cache Memory Adapter board. In the event of a power failure, the cache |

Table 14 Controller chassis (continued)

| Item | | | Description |
|--------------------|-----|-----|---|
| Name | Min | Max | . |
| | | | data will not be lost and will remain protected on the Cache Backup Memory Solid States Disk drive. |
| AC-DC power supply | 2 | 4 | 200–220 VAC input. Provides power to the DKC in a redundant configuration to prevent system failure. Up to four power supplies can be used as needed to provide power to additional components. |
| Cooling fan | 10 | 10 | Each fan unit contains two fans to ensure adequate cooling in case one of the fans fails. |

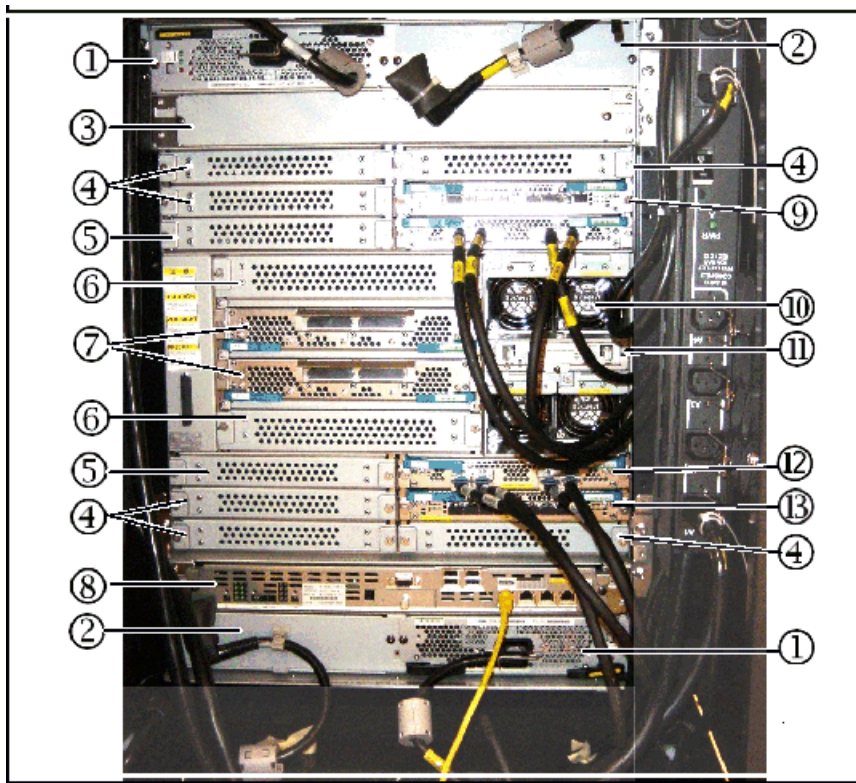
The following illustrations show the front and rear views of a controller chassis that is configured with the minimum number of components. The system control panel (#1 in the front view) is described in the next section.

Figure 11 Controller chassis front view (minimum configuration)



| Item | Description | Item | Description |
|------|--|------|----------------------|
| 1 | Control Panel | 2 | Fan (10 total) |
| 3 | Slots for optional Cache Memory Adapter. | 4 | Cache Memory Adapter |
| 5 | Slots for additional Processor blades | 6 | Processor blades |

Figure 12 Controller chassis rear view (minimum configuration)

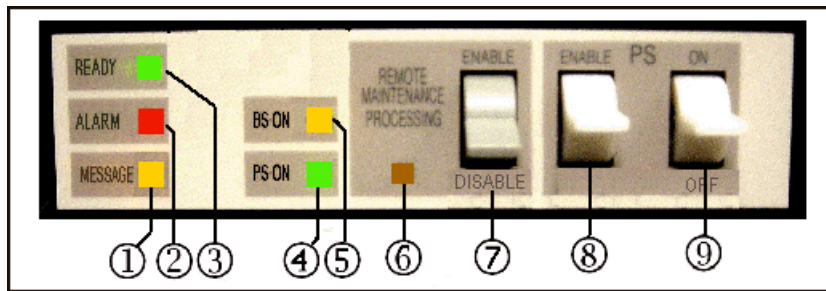


| Item | Description | Item | Description |
|------|--|------|--|
| 1 | Power Supply (2 min, 4 max) | 2 | Slots for optional Power Supply. |
| 3 | 2 nd Service Processor (optional for Module-0) or Hub (optional for Module-1) | 4 | Slots for Channel Adapter board. |
| 5 | Slots for optional Disk Control Adapter or Channel Adapter board. | 6 | Slots for optional Express Switch Adapter. |
| 7 | Express Switch Adapter | 8 | 1 st Service Processor for Module-0 or 1 st Hub for Module-1 |
| 9 | Channel Adapter board | 10 | Fan |
| 11 | SSVPMN | 12 | Disk Control Adapter |
| 13 | Channel Adapter board | - | - |

System control panel

The following illustration shows the P9500 system control panel. The table following the illustration explains the purpose of each of the controls and LEDs on the panel.

Figure 13 P9500 system control panel



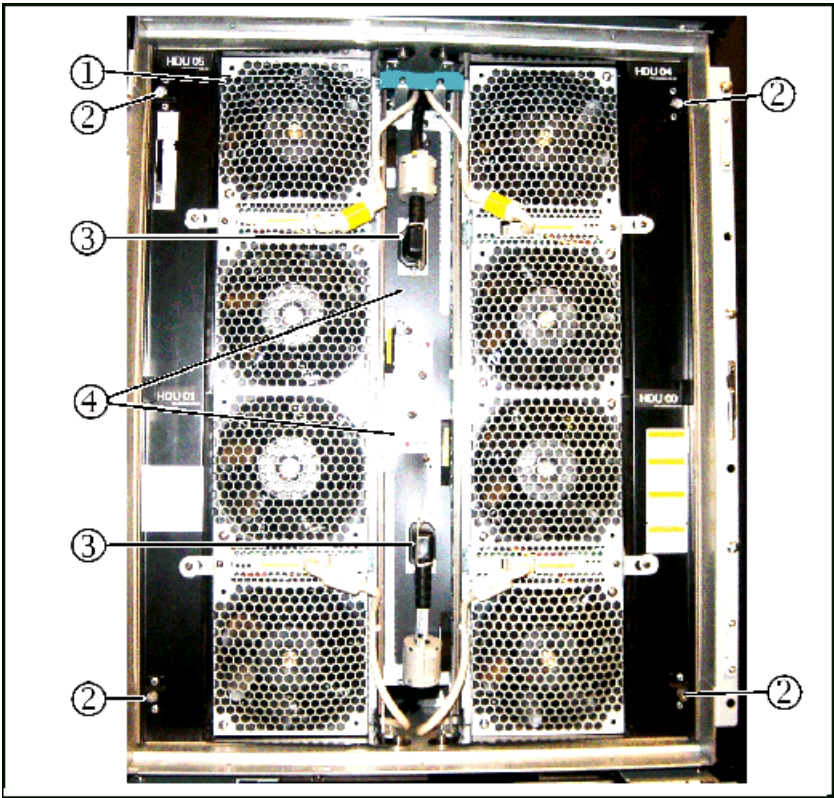
| Item | Description | Item | Description |
|------|---|------|--|
| 1 | MESSAGE - Amber LED ON: indicates that a SIM (Message) was generated from either of the clusters. Applied to both storage clusters. Blinking: Indicates that a SVP failure has occurred. | 2 | ALARM - Red LED Indicates DC under voltage of any DKC part, DC over current, abnormally high temperature, or that an unrecoverable failure occurred. |
| 3 | READY - Green LED Indicates that input/output operation on the channel interface is enabled. | 4 | PS ON - Green LED Indicates that the system is powered on, that the POST is complete, and that the system has booted up and is ready for use. |
| 5 | BS ON - Amber LED Indicates that the Sub Power supply is on. (CL 1 or CL 2) | 6 | REMOTE MAINTENANCE PROCESSING - Amber LED Indicates that the system is being remotely maintained. |
| 7 | REMOTE MAINTENANCE ENABLE/DISABLE - switch When ON , permits remote maintenance. | 8 | PS SW ENABLE - switch Used to enable the PS ON/PS OFF switch. |
| 9 | PS ON/PS OFF - switch Turns the system power on or off. | - | - |

Drive chassis

The drive chassis includes two back-to-back disk drive assemblies. Each assembly includes HDDs, SSW boards, HDD PWR boards, eight cooling fans, and two AC-DC power supplies. All components are configured in redundant pairs to prevent system failure. All the components can be added or replaced while the disk array is in operation.

The following illustration shows the rear view of the drive chassis. The table following the illustration describes the drive chassis components.

Figure 14 Drive chassis

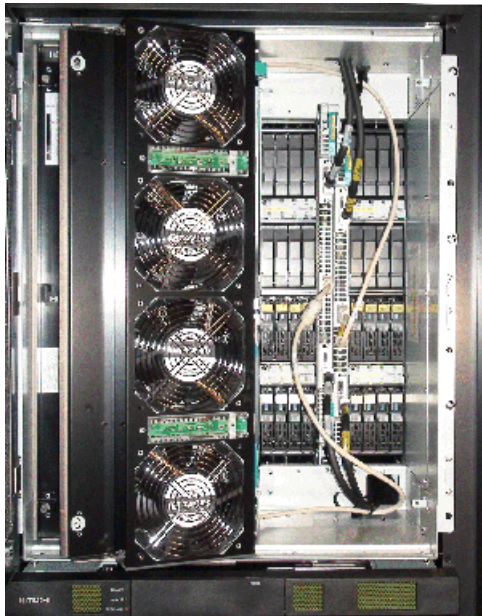


| Item | Description | Item | Description |
|------|---------------|------|---|
| 1 | Fan (8 total) | 2 | Fan assembly lock screw (Loosen screw to open fan door.) |
| 3 | Power Cable | 4 | HDD Power Supply |

The fans on the front of the unit are intake fans that pull ambient air into the unit. The fans on the rear assembly are exhaust fans that blow hot air out of the unit. The two sets of fans work together to create a large airflow through the unit. Either fan assembly is sufficient to cool the unit. Therefore there is no time limit when changing disk drives, as long as either the front or the rear fan assembly is in place.

CAUTION: To prevent the unit from overheating, both the front and rear fan assemblies should never be opened at the same time while the system is running.

Figure 15 Disk chassis (fan door open)



As shown in [Figure 15 \(page 59\)](#), the fan assemblies on both the front and rear sides of the drive chassis fold out and away from the unit to allow access to the disk drives. The three speed fans in the drive chassis are thermostatically controlled by a temperature sensor (thermistor) in the unit. The sensor measures the temperature of the exhaust air from the unit and sets the fan speed as needed to maintain the unit temperature within a preset range. When the unit is not busy and cools down, the fan speed is reduced, saving energy and reducing the noise level of the unit.

When the fan assemblies are opened, the power to the fans is automatically switched off and the fans stop rotating. This helps prevent possible injury because there is no protective screen on the back side of the fans.

Cache memory

The P9500 can be configured with up to 512 GB of cache memory per controller chassis (1024 GB for a two-module system). The cache is nonvolatile and is protected from data loss with onboard batteries to backup cache data into the onboard Cache Backup Memory Solid States Disk drive.

Each controller chassis can contain from two to eight cache memory adapter boards. Each board contains from 8 GB to 64 GB.

Cache memory adaptor boards are installed in pairs and work together to provide cache and shared memory for the system. In addition to the memory on the cache boards, 4 GB of cache memory is also located on each Micro Processor Blade board. See the following illustration.

Figure 16 Cache memory

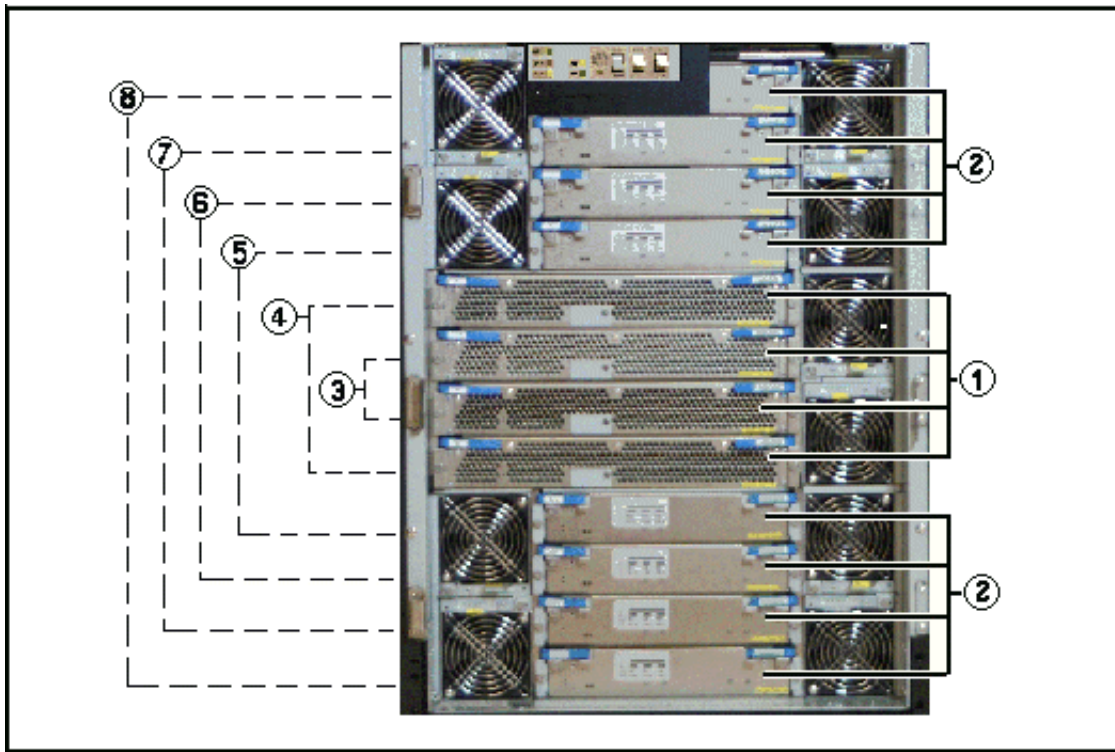


Table 15 Cache memory

| Item | Description | Item | Description |
|------|--|------|---|
| 1 | Micro Processor Blade Includes 4 GB cache | 2 | Cache Memory Adapter: 8, 16, or 24 GB standard 32 GB SSD drives optional 1 or 2 16 GB SSD drives |
| 3 | Micro Processor Blade cluster 0 | 4 | Micro Processor Blade cluster 1 |
| 5 | Cache cluster 0 | 6 | Cache cluster 1 |
| 7 | Cache cluster 2 | 8 | Cache cluster 3 |

Memory operation

The P9500 places all read and write data in the cache. The amount of fast-write data in cache is dynamically managed by the cache control algorithms to provide the optimum amount of read and write cache, depending on the workload read and write I/O characteristics.

Mainframe hosts can specify special attributes (for example, cache fast write command) to write data (typically sort work data) without write duplexing. This data is not duplexed and is usually given a discard command at the end of the sort, so that the data will not be destaged to the drives.

Data protection

The P9500 is designed so that it cannot lose data or configuration information from the cache if the power fails. The cache is protected from data loss up for up to ten minutes by the cache destage batteries while the data is copied to the cache SSD (flash memory) on the cache boards (see ["Battery backup operations"](#) (page 67)).

Shared memory

The P9500 shared memory is not on a separate memory module as it was in the previous hardware systems. Shared memory resides by default on the first pair of cache boards in controller chassis #0.

When you install software features such as Snapshot or Continuous Access Journal, the shared memory usage increases as software features are installed. Shared memory can use up to 56 GB.

Depending on how much cache memory is installed, it may be necessary to install more cache memory as more software features are installed in the system. Up to 32 GB can be installed on each cache board. When 32 GB of cache is installed, it is also necessary to install a second SSD (cache flash memory) on the cache board to back up the cache in case of power failure. Additional cache backup SSD memory comes in 32 and 64 GB capacities.

In addition to cache, the shared memory on each cache board contains a 1/2 GB cache directory to safeguard write pending data in the cache in the unlikely case of double failure of the shared memory cache area. The cache directory has mapping tables for the Micro Processor Blade LDEVs and the allocated cache slots in each Micro Processor Blade cache partition.

NOTE: Shared Memory in the P9000 is not a separate memory module as it was in the HP XP24000/20000 disk arrays.

Flash storage chassis

This section includes information on the flash module drive (FMD), flash storage unit (FSU), and flash storage chassis (FSX).

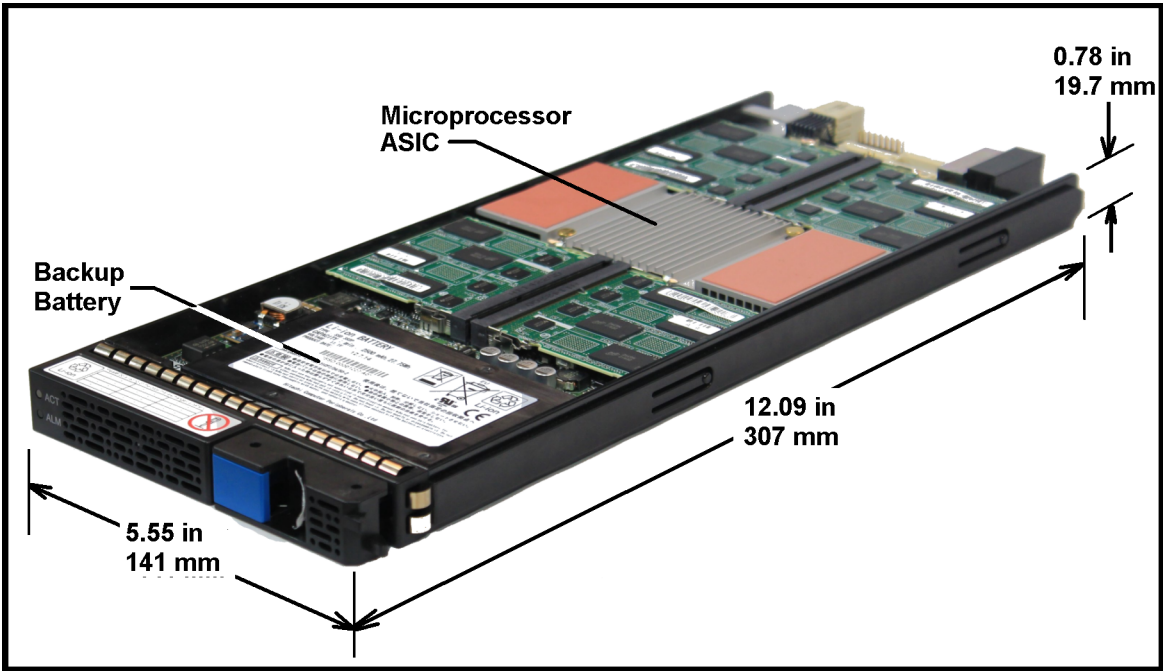
P9000 flash module

The P9000 flash module is a custom-designed and manufactured enterprise class solid state storage module. It uses a high performance, custom ASIC flash controller and standard flash memory chips in an implementation that exceeds the performance of expensive SLC SSDs, but costs less than less expensive MLC SSDs. The FMD greatly improves the performance and solid state storage capacity of the VSP system, while significantly reducing the cost per TB of storage.

Even in the initial capacity of 1.6 TB per FMD, the FMD outperforms both MLC and SLC flash drives, has a longer service life, requires less power, and generates less heat per TB than SSDs.

FMDs can be used instead of, or in addition to, disk and flash drives, but they are installed in a flash storage “chassis” composed of a cluster four flash module units (FMU). The next section describes the FMU.

Figure 17 Flash Module Drive



Flash module unit

The flash module box (FMU) is a 2U high chassis that contains up to 12 FMDs, plus two redundant power supplies and two redundant SSW adapters.

Figure 18 Flash Module Unit

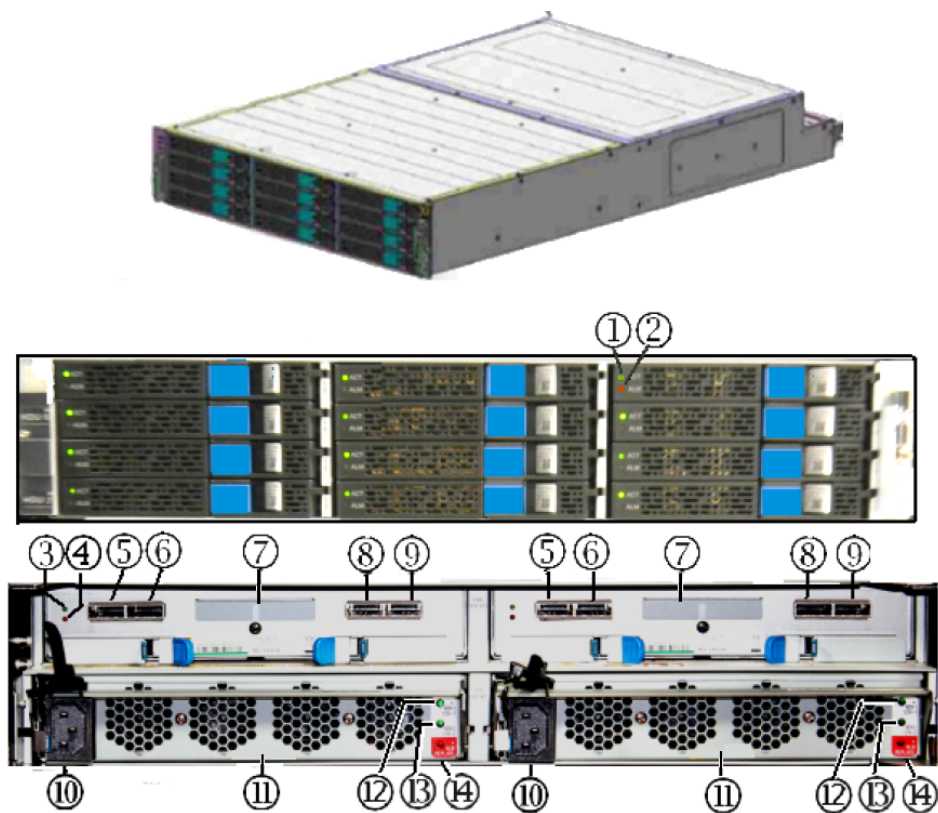


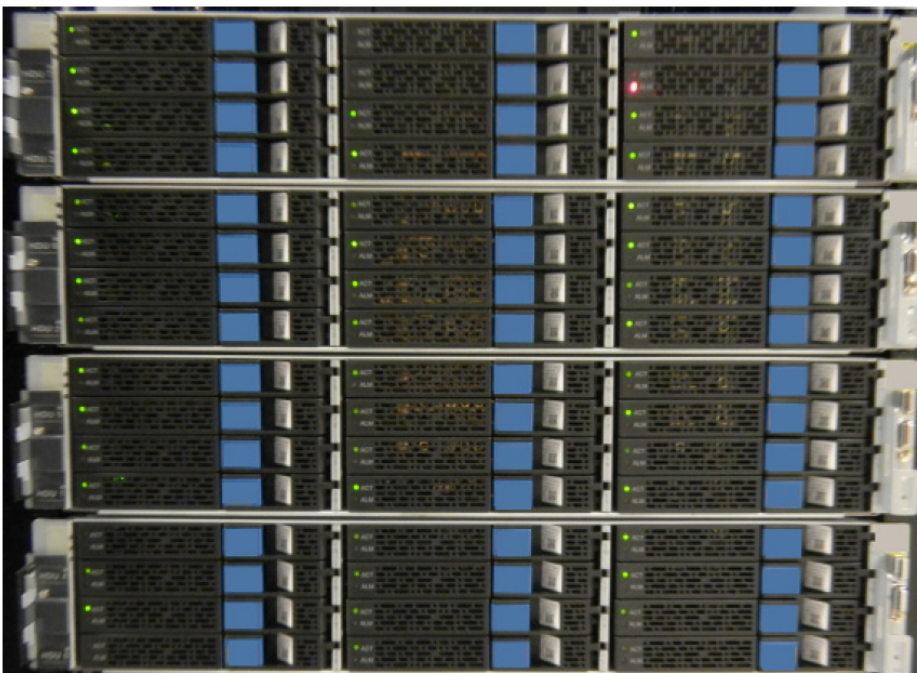
Table 16 Flash Module Unit

| Item | Description | Item | Description |
|------|---|------|--|
| 1 | FMD Active LED - lights when FMD is activated. Blinks at drive access. | 8 | SAS / SSW standard OUT connector. |
| 2 | FMD Alarm LED - lights when FMD has an error and should be replaced. | 9 | SAS / SSW high performance OUT connector. |
| 3 | SAS / SSW Module Power LED. | 10 | Power cord receptacle. |
| 4 | SAS / SSW Module Alarm LED - indicates fatal error condition. | 11 | Power Supply - 220 VAC input, draws approximately 265 watts. NOTE: The power supply occupy the lower half of the FM box (the SSW occupies the upper half). |
| 5 | SAS / SSW standard IN connector. | 12 | Power Supply Ready 1 LED - lights when 12 VDC power#1 is ready. |
| 6 | SAS / SSW high performance IN connector. | 13 | Power Supply Ready 2 LED - lights when 12 VDC power #2 is ready. |
| 7 | SAS / SSW adapter - connects the FMDs to the BEDs in the controller via SSW cables. NOTE: Be sure to use the same SSW jumper settings when replacing an SSW. Contact HP Technical Support before replacing a SSW. | 14 | Power Supply alarm LED - lights when power supply has an error. |

Flash storage chassis

The flash storage chassis (FBX) is a cluster of four FMUs as shown in the following illustration. There is not an actual chassis or enclosure surrounding the four FSBs, but since it takes the place of a DKU drive chassis, the cluster is referred to as a chassis for consistency. FMDs can be added to the FBX in increments of four, eight, or sixteen, depending on the desired RAID configuration.

Figure 19 Flash storage chassis



Cache memory

Your P9000 can be configured with up to 512 GB of cache memory per controller chassis (1 TB for a two-module system). Each controller chassis can contain from two to eight cache memory adapter boards. Each board contains from 8 GB to 64 GB.

Cache memory adaptor boards are installed in pairs and work together to provide cache and shared memory for the system. Each pair is called a cluster. From one to four cache clusters can be installed in a controller.

Table 17 Drive Specifications

| Drive Type | Size (inches) ¹ | Drive Capacity | Speed (RPM) |
|--------------------------|----------------------------|------------------------|-------------|
| HDD (SAS) | 2-1/2 | 300 GB | 15,000 |
| | | 300 GB, 600 GB, 900 GB | 10,000 |
| | | 500 GB | 7,200 |
| | | 1 TB | 7,200 |
| SSD (Flash) ¹ | 2-1/2 | 200 GB, 400 GB, 800 GB | n/a |
| FDM (flash module) | 5.55 x 12.09 x 0.78 | 1.6, 3.2 TB | n/a |

¹ Each drive size requires its own chassis.

Minimum number of drives - Four HDDs or SSDs per controller chassis (two in upper half, two in lower half). HDDs or SSDs must be added four at a time to create RAID groups, unless they are spare drives. The minimum number of operating FMD drives is four, one in each FMU in the FBX chassis. Spares are additional.

Table 18 Maximum Number of Drives

| Drive Type (inches) | Drive Chassis | Single Module (3-rack system) | Dual Module (6-rack system) |
|-------------------------|------------------|-------------------------------|-----------------------------|
| HDD, 2-1/2 | 128 | 1024 | 2048 |
| SSD, 2-1/2 ¹ | 128 ² | 128 ³ | 256 ³ |
| FMD ⁴ | 48 | 964 | 192 |

¹ Each drive size requires its own chassis.

² SSD drives can be mounted all in one drive chassis or spread out among all of the chassis in the storage system.

³ Recommended maximum number.

⁴ FMD drives are not the same form factor as HDDs or SSDs and require an FBX chassis. See **"P9000 flash module"** (page 61).

System capacities with smart flash modules

The following table lists the P9000 system storage capacities when using FMDs.

Table 19 System capacities with smart flash modules

| Considering hot sparing requirements | | | | | | | |
|--------------------------------------|-----|-------|-------|-------|-------|-------|-------|
| | | R1 | | R5 | | R6 | |
| | | 2D+2P | 4D+4P | 3D+1P | 7D+1P | 6D+2P | 14+2P |
| Single flash chassis, max. capacity | | | | | | | |
| 1.6 GB | Raw | 70.4 | 64.0 | 70.4 | 64.0 | 64.0 | 51.2 |

Table 19 System capacities with smart flash modules *(continued)*

| Considering hot sparing requirements | | | | | | | |
|---|--------|-------|-------|-------|-------|-------|-------|
| | | R1 | | R5 | | R6 | |
| | | 2D+2P | 4D+4P | 3D+1P | 7D+1P | 6D+2P | 14+2P |
| | Usable | 35.2 | 32.0 | 52.8 | 56.0 | 48.0 | 44.8 |
| 3.2 GB | Raw | 140.8 | 128.0 | 140.8 | 128.0 | 128.0 | 102.4 |
| | Usable | 70.4 | 64.0 | 105.6 | 112.0 | 96.0 | 89.6 |
| Flash chassis pair max. capacity | | | | | | | |
| 1.6 GB | Raw | 147.2 | 140.8 | 147.2 | 140.8 | 140.8 | 128.0 |
| | Usable | 73.6 | 70.4 | 110.4 | 123.2 | 105.6 | 112.0 |
| 3.2 GB | Raw | 254.4 | 281.6 | 254.4 | 281.6 | 281.6 | 256.0 |
| | Usable | 147.2 | 140.8 | 220.8 | 246.4 | 211.2 | 224.0 |
| Total P9500 max. capacity | | | | | | | |
| 1.6 GB | Raw | 294.4 | 281.6 | 294.4 | 281.6 | 281.6 | 256.0 |
| | Usable | 147.2 | 140.8 | 220.8 | 246.4 | 211.2 | 224.0 |
| 3.2 GB | Raw | 588.8 | 563.2 | 588.8 | 563.2 | 563.2 | 512.0 |
| | Usable | 294.4 | 281.6 | 441.6 | 492.8 | 422.4 | 448.0 |
| Considering hot sparing requirements, number of flash modules | | | | | | | |
| Single flash chassis max. capacity - add two hot spares | | | | | | | |
| 1.6 GB | Count | 44 | 40 | 44 | 40 | 40 | 32 |
| 3.2 GB | | 88 | 80 | 88 | 80 | 80 | 64 |
| Flash chassis pair max. capacity - add four hot spares | | | | | | | |
| 1.6 GB | Count | 92 | 88 | 92 | 88 | 88 | 80 |
| 3.2 GB | | 184 | 176 | 184 | 176 | 176 | 160 |
| Total VSP max. capacity - add eight hot spares | | | | | | | |
| 1.6 GB | Count | 184 | 176 | 184 | 176 | 176 | 160 |
| 3.2 GB | | 368 | 352 | 368 | 352 | 352 | 320 |

4 Power On/Off procedures

Safety and environmental information

- △ **CAUTION:** Before operating or working on the P9500 disk array, read the safety section in the *HP XP P9000 Site Preparation Guide* and the environmental information in “[Regulatory compliance notices](#)” (page 85).
-

Standby mode

When the disk array power cables are plugged into the PDUs and the PDU breakers are ON, the disk array is in standby mode. When the disk array is in standby mode:

- The Basic Supply (BS) LED on the control panel is ON. This indicates that power is applied to the power supplies.
- The READY LED is OFF. This indicates that the controller and drive chassis are not operational.
- The fans in both the controller and drive chassis are running.
- The cache destage batteries are being charged.
- The disk array consumes significantly less power than it does in operating mode. For example, a disk array that draws 100 amps while operating draws only about 70 amps in standby mode (see “[Electrical specifications](#)” (page 80) for power consumption specifications).

To put the disk array into standby mode from the OFF condition:

1. Ensure that power is available to the AC input boxes and PDUs in all racks in which the P9500 disk array is installed.
2. Turn all PDU power switches/breakers ON.

To put the disk array into standby mode from a power on condition, complete the power off procedures in this chapter. See “[Power Off procedures](#)” (page 67).

To completely power down the disk array, complete the power off procedures in this chapter, then turn off all PDU circuit breakers.

- △ **CAUTION:** Make certain that the disk array is powered off normally and in standby mode before turning off the PDU circuit breakers. Otherwise, turning off the PDU circuit breakers can leave the disk array in an abnormal condition.
-

Power On/Off procedures

This section provides general information about power on/off procedures for the P9500 disk array. If needed, consult HP Technical Support for assistance.

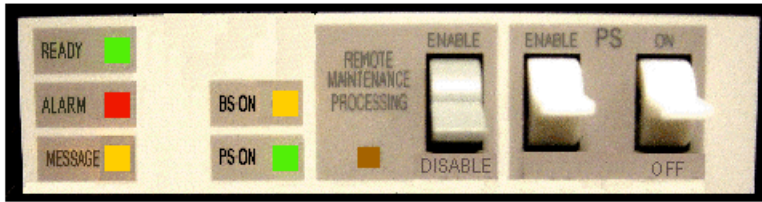
Power On procedures

- △ **CAUTION:** Only a trained HP support representative can restore power to the disk array.
-

Prerequisites

- Ensure that the disk array is in standby mode. See “[Standby mode](#)” (page 66).

NOTE: The control panel includes a safety feature to prevent the storage system power from accidentally being turned on or off. The PS power ON/OFF switch does not work unless the ENABLE switch is moved to and held in the ENABLE position while the power switch is moved to the ON or OFF positions.



Follow this procedure exactly when powering the disk array on. Refer to the illustration of the control panel as needed.

1. On the control panel, check the amber BS LED and make sure it is lit. It indicates that the disk array is in standby mode.
2. In the PS area on the control panel, move the **Enable** switch to the ENABLED position. Hold the switch in the Enabled position and move the **PS ON** switch to the ON position. Then release the ENABLE switch.
3. Wait for the disk array to complete its power-on self-test and boot-up processes. Depending on the disk array configuration, this may take several minutes.
4. When the Ready LED is ON, the disk array boot up operations are complete and the disk array is ready for use.

NOTE: If the Alarm LED is also on, or if the Ready LED is not ON after 20 minutes, please contact HP Technical Support. The disk array generates a SIM that provides the status of the battery charge (see [“Cache destage batteries”](#) (page 68)).

Power Off procedures

- △ **CAUTION:** Only a trained HP support representative can shut down and power off the disk array. Do not attempt to power down the disk array other than during an emergency.
-

Prerequisites:

- Ensure that all software specific shutdown procedures have been completed. Please see the applicable user manuals for details.
- Ensure that all I/O activity to the disk array has stopped. You can vary paths offline and/or shut down the attached hosts.

Follow this procedure exactly when powering the disk array off.

1. In the PS area on the power panel, move the **Enable** switch to the Enabled position. Hold the switch in the Enabled position and press the **PS OFF** switch on the Operator Panel.
2. Wait for the disk array to complete its shutdown routines. Depending on the disk array configuration and certain MODE settings, it can take up to 20 minutes for the disk array to copy data from cache to the disk drives and for the disk drives to spin down.

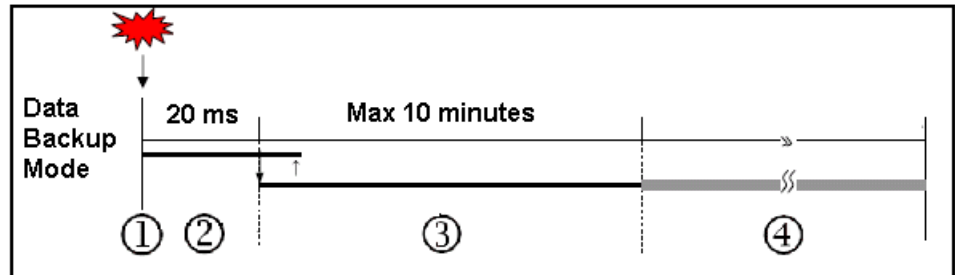
NOTE: If the Ready and PS LEDs do not turn OFF after 20 minutes, contact HP Technical Support.

Battery backup operations

The P9500 is designed so that it cannot lose data or configuration information if the power fails. The battery system is designed to provide enough power to completely destage all data in the cache if two consecutive power failures occur and the batteries are fully charged. If the batteries do not contain enough charge to provide sufficient time to destage the cache when a power failure occurs, the cache operates in write through mode. This synchronously writes to HDDs to prevent slow data throughput in the cache. When the battery charge is 50% or more, the cache write protect mode operates normally.

When a power failure occurs and continues for 20 milliseconds or less, the disk array continues normal operation. If the power failure exceeds 20 milliseconds, the disk array uses power from the batteries to back up the cache memory data and disk array configuration data to the cache flash memory on each cache board. This continues for up to ten minutes. The flash memory does not require power to retain the data. The following illustration shows the timing in the event of a power failure.

Figure 20 Battery backup operations



| Item | Description |
|------|---|
| ① | Power failure occurs |
| ② | The storage system continues to operate for 20 milliseconds and detects the power failure. |
| ③ | The cache memory data and the storage system configuration are backed up to the cache flash memory on the cache boards. The backup continues even if power is restored during the backup. |
| ④ | Unrestricted data backup. Data is continuously backed up to the cache flash memory. |

Cache destage batteries

The environmentally friendly nickel hydride cache destage batteries are used to save disk array configuration and data in the cache in the event of a power failure. The batteries are located on the cache memory boards and are fully charged at the distribution center where the disk array is assembled and tested. Before the system is shipped to a customer site, the batteries are disconnected by a jumper on the cache board. This prevents them from discharging during shipping and storage until the system is installed. At that time, HP Technical Support representative connects the batteries.

NOTE: The disk array generates a SIM when the cache destage batteries are not connected.

Battery life

The batteries have a lifespan of three years, and will hold the charge when connected. When the batteries are connected and power is on, they are charged continuously. This occurs during both normal system operation and while the system is in standby mode.

When the batteries are connected and the power is off, the batteries slowly discharge. They will have a charge of less than 50% after two weeks without power. When fully discharged, the batteries must be connected to power for three hours to fully recharge.

NOTE: The disk array generates a SIM when the cache destage batteries are not charged to at least 50%. The LEDs on the front panel of the cache boards also show the status of the batteries.

Long term array storage

While connected, the cache destage batteries will completely discharge in two to three weeks without power applied. If you do not use a P9500 for two weeks or more, contact HP Technical

Support to move the batteries to a disk array that is being used, or turn the disk array on to standby mode for at least 3 hours once every two weeks.

If you store the system for more than two weeks and do not disconnect the cache destage batteries, when you restart the system, the batteries will need to charge for at least 90 minutes before the cache will be protected. To prevent the batteries from discharging during long term storage, contact HP Technical Support and ask them to disconnect the battery jumpers on the cache boards.

5 Troubleshooting

Solving problems

The P9500 disk array is highly reliable and is not expected to fail in any way that would prevent access to user data. The READY LED on the control panel must be ON when the disk array is operating online.

The following table lists possible error conditions and provides recommended actions for resolving each condition. If you are unable to resolve an error condition, contact your HP representative, or call the support center for assistance.

Table 20 Troubleshooting

| Error Condition | Recommended Action |
|--|---|
| Error message displayed. | Determine the type of error (see the SIM codes section). If possible, remove the cause of the error. If you cannot correct the error condition, call the support center for assistance. |
| General power failure | Turn off all PDU switches and breakers. After the facility power comes back on steady, turn them back on and power the system up. See Chapter 4 for instructions. If needed, call HP support for assistance. |
| Fence message is displayed on the console. | Determine if there is a failed storage path. If so, toggle the RESTART switch, and retry the operation. If the fence message is displayed again, call the support center for assistance. |
| READY LED does not go on, or there is no power supplied. | Call the support center for assistance. WARNING: Do not open the P9500 control frame/controller or touch any of the controls. |
| ALARM LED is on. | If there is a temperature problem in the area, power down the disk array, lower the room temperature to the specified operating range, and power on the storage system. Call the support center if needed for assistance with power off/on operations. If the area temperature is not the cause of the alarm, call the support center for assistance. |

Service information messages

The P9500 disk array generates SIMs to identify normal operations. For example, Continuous Access Synchronous pair status change as well as service requirements and errors or failures. For assistance with SIMs, please call the support center.

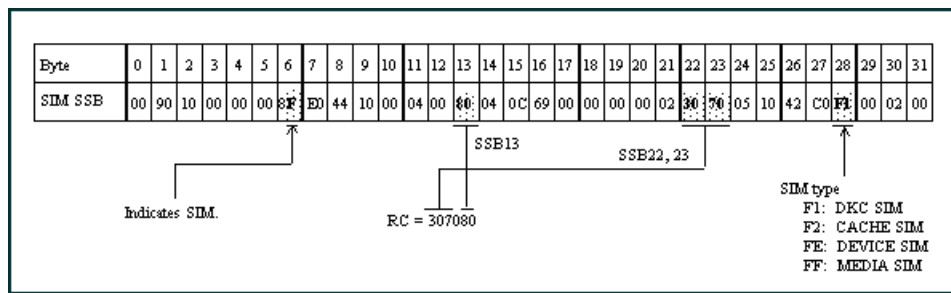
SIMs can be generated by the channel adapters and disk adapters and by the SVP. All SIMs generated by the P9500 are stored on the SVP for use by HP personnel, logged in the SYS1.LOGREC dataset of the mainframe host system, displayed by the Remote Web Console software, and reported over SNMP to the open system host. The SIM display on Remote Web Console enables users to remotely view the SIMs reported by the attached disk array. Each time a SIM is generated, the amber Message LED on the control panel turns on. The C-Track remote maintenance tool also reports all SIMs to the support center

SIMs are classified according to severity. There are four levels: service, moderate, serious, or acute. The service and moderate SIMs (lowest severity) do not require immediate attention and are addressed during routine maintenance. The serious and acute SIMs (highest severity) are reported to the mainframe host (s) once every eight hours.

NOTE: If a serious or acute level SIM is reported, call the support center immediately to ensure that the problem is being addressed.

The following figure illustrates a typical 32 byte SIM from the P9500 disk array. SIMs are displayed by reference code (RC) and severity. The six digit RC, which is composed of bytes 22, 23, and 13, identifies the possible error and determines the severity. The SIM type, located in byte 28, indicates which component experienced the error.

Figure 21 Service Information Message



C-Track

The C-Track remote support solution detects and reports events to the HP Support Service. C-Track transmits heartbeats, SIMs, and configuration information for remote data collection and monitoring purposes. C-Track also enables the HP Support Service to remotely diagnose issues and perform maintenance (if the customer allows the remote maintenance). The C-Track solution offers Internet connectivity only. If you choose the Internet-based remote support solution, additional infrastructure and site preparation are required. Additional preparation may include server and router requirements, which you and HP may be responsible for implementing.

Insight Remote Support

HP strongly recommends that you install HP Insight Remote Support software to complete the installation or upgrade of your product and to enable enhanced delivery of your HP Warranty, HP Care Pack Service or HP contractual support agreement. HP Insight Remote Support supplements your monitoring, 24x7 to ensure maximum system availability by providing intelligent event diagnosis, and automatic, secure submission of hardware event notifications to HP, which will initiate a fast and accurate resolution, based on your product's service level. Notifications may be sent to your authorized HP Channel Partner for on-site service, if configured and available in your country. The HP Insight Remote Support products available for the P9500 disk arrays are described in ["P9500 disk array remote support products"](#) (page 71).

NOTE: HP Insight Remote Support Standard is not supported on XP and P9500 Disk Arrays.

Table 21 P9500 disk array remote support products

| HP Product | Description | Application |
|------------|---|--|
| AE241A | HP XP/P9500 Remote Device Access Support | For customers that fully commit to use HP Remote Support. It uses HP Insight Remote Support for P9500 Remote Device Monitoring utilizing LAN/Internet connectivity and Remote Device Access Support. This configuration is required to meet the objectives of XP disk array's Internet connectivity with Remote Device Access initiative and prerequisites for Critical Support contracts. HP recommends that the AE241A product with Internet connectivity should be utilized for all new P9500 installations, to ensure the optimal support model and highest TCE. |
| AE242A | HP XP/P9500 no Remote Device Access Support | For customers that commit to utilize Internet and Insight Remote Support connectivity for P9500 Remote Device Monitoring but will not allow for Remote Device Access to the P9500 array from HP for proactive and critical support processes. With no Remote Device |

Table 21 P9500 disk array remote support products *(continued)*

| HP Product | Description | Application |
|------------|---|---|
| | | Access, Critical Support contract prerequisites cannot be met. |
| AE244A | HP XP/P9500 Mission Critical No LAN Support | For a customer whose strict security protocols specifically prohibit inbound/outbound traffic to/from the data center and thus will not allow Remote Support connection by either modem or LAN/internet connectivity; but does have Mission Critical Services with Customer Engineer onsite included in the terms of the support contract. Factory Authorization will be required to order this product. Proof of valid Customer Engineer onsite Mission Critical support contract must be provided for Factory Authorization approval. |
| AE245A | HP XP/P9500 No Mission Critical LAN Support | For a customer whose strict security protocols specifically prohibit inbound/outbound traffic to/from the data center and thus will not allow Remote Support connection by either modem or LAN and does not have a Mission Critical Services on-site contract. The added cost of this configuration only covers the additional warranty support cost to HP during warranty period. Other additional costs can also be incurred for support contracts for customers who do not have remote support configured. |

Details are available at:

<http://www.hp.com/go/insightremotesupport>

To download the software, go to Software Depot:

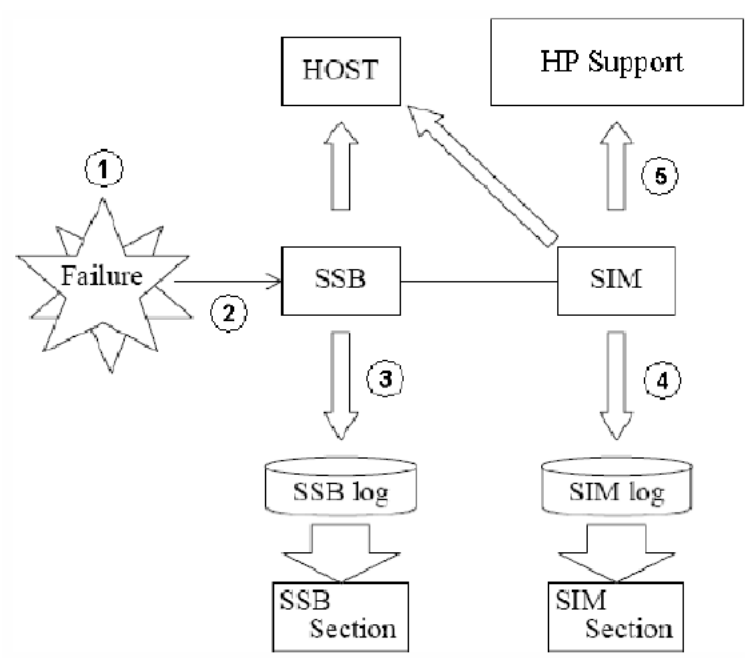
<http://www.software.hp.com>

Select Insight Remote Support from the menu on the right.

Failure detection and reporting process

If a failure occurs in the system, the failure is detected and reported to the system log, the SIM log, and HP technical support, as shown in [“Failure reporting process”](#) (page 73).

Figure 22 Failure reporting process



6 Support and other resources

Contacting HP

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Subscription service

Receive, by email, support alerts announcing product support communications, driver updates, software releases, firmware updates, and customer-replaceable component information by signing up at <http://www.hp.com/go/myadvisory>.

To change options for support alerts you already receive, click the **Sign in** link on the right.

Documentation feedback

HP welcomes your feedback.

To make comments and suggestions about product documentation, please send a message to storedocsfeedback@hp.com. Include the document title and manufacturing part number. All submissions become the property of HP.

Related information

The following documents [and websites] provide related information:

- *HP XP P9000 External Storage for Open and Mainframe Systems User Guide*
- *HP XP P9000 Provisioning for Open Systems User Guide*
- *HP XP P9000 Remote Web Console Messages*
- *HP XP P9000 RemoteWeb Console User Guide*
- *HP XP P9000 SNMP Agent User Guide*

You can find these documents on the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Disk Storage Systems** for hardware or **Storage Software** for software, and then select your product.

HP websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- http://www.hp.com/service_locator

- <http://www.hp.com/support/manuals>
- <http://www.hp.com/support/downloads>
- <http://www.hp.com/storage/whitepapers>

Conventions for storage capacity values

P9000 disk arrays use the following values to calculate physical storage capacity values (hard disk drives):

- 1 KB (kilobyte) = 1,000 bytes
- 1 MB (megabyte) = 1,000² bytes
- 1 GB (gigabyte) = 1,000³ bytes
- 1 TB (terabyte) = 1,000⁴ bytes
- 1 PB (petabyte) = 1,000⁵ bytes
- 1 EB (exabyte) = 1,000⁶ bytes

P9000 disk arrays use the following values to calculate logical storage capacity values (logical devices):

- 1 KB (kilobyte) = 1,024 bytes
- 1 MB (megabyte) = 1,024² bytes
- 1 GB (gigabyte) = 1,024³ bytes
- 1 TB (terabyte) = 1,024⁴ bytes
- 1 PB (petabyte) = 1,024⁵ bytes
- 1 EB (exabyte) = 1,024⁶ bytes

Typographic conventions

Table 22 Document conventions

| Convention | Element |
|--|---|
| Blue text: Table 22 (page 75) | <ul style="list-style-type: none"> • Cross-reference links and e-mail addresses • A cross reference to the glossary definition of the term in blue text |
| Blue, bold, underlined text | email addresses |
| Blue, underlined text: http://www.hp.com | Website addresses |
| Bold text | <ul style="list-style-type: none"> • Keys that are pressed • Text typed into a GUI element, such as a box • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes |
| <i>Italic</i> text | Text emphasis |

Table 22 Document conventions *(continued)*

| Convention | Element |
|-------------------------------|--|
| Monospace text | <ul style="list-style-type: none">• File and directory names• System output• Code• Commands, their arguments, and argument values |
| <i>Monospace, italic</i> text | <ul style="list-style-type: none">• Code variables• Command variables |
| Monospace, bold text | Emphasized monospace text |

 **WARNING!** Indicates that failure to follow directions could result in bodily harm or death.

 **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.


 **IMPORTANT:** Provides clarifying information or specific instructions.

NOTE: Provides additional information.

 **TIP:** Provides helpful hints and shortcuts.

Rack stability

Rack stability protects personnel and equipment.

-
-  **WARNING!** To reduce the risk of personal injury or damage to equipment:
- Extend leveling jacks to the floor.
 - Ensure that the full weight of the rack rests on the leveling jacks.
 - Install stabilizing feet on the rack.
 - In multiple-rack installations, fasten racks together securely.
 - Extend only one rack component at a time. Racks can become unstable if more than one component is extended.
-

A Comparing the XP24000/XP20000 Disk Array and P9500

Comparison of the XP24000/XP20000 Disk Array and P9500

The P9500 includes several upgrades from the XP24000/XP20000 Disk Array as well as a number of new features. These include:

- **High scalability.** The system supports configurations of 2 1/2 disk drives in either a single or dual DKC configuration
- **Shared processors.** In the P9500, the processor and interface cards are separate. This allows either or both to be configured separately, and allows each processor to share resources across multiple interface cards.
- **Load balancing.** The P9500 disk array allows workloads to be better balanced across management processor and breaks the affinity between specific front end and back end ports with specific processors.
- **High performance.** The system uses shared high performance quad core processors instead of single core. This significantly increases system total processing speed and distributes processing across the CHAs and DKAs as needed.
- **Faster access** to system control information through the use of on board memory.
- **Storage management usability improvements.** The new version includes a user friendly, task based GUI that reduces the number of operations needed to complete a task and includes wizards to assist users in new or repetitive tasks. This version of Remote Web Console also includes context sensitive online help.

The following tables show the main differences between the XP24000/XP20000 Disk Array and the P9500.

Table 23 Storage management improvements

| P9500 | XP24000/XP20000 Disk Array |
|---|-------------------------------------|
| Use Case Oriented Operation | Architecture Oriented |
| Fewer steps and clicks | Many steps and clicks for operation |
| Faster operation and higher performance | Slow performance impression |
| Unified User interface (GUI/CLI) | Many user interfaces |

Table 24 Basic Mainframe functional differences

| Feature | P9500 | XP24000/XP20000 Disk Array |
|------------------------------------|--|------------------------------------|
| FlashCopy Version 1 | Not supported (Only FC V2) | Supported |
| Drive Emulation Type | 3380-3 3390-1/2/3/3R/9/L/M/V | 3380-3 3390-1/2/3/3R/9/L/M |
| DKC Emulation Type | 2105/2107 | 3990/2105/2107 |
| The number of multi relations | 16 | 16 |
| The maximum relations in system | 1048575 | 1048575 |
| The maximum relations for each VOL | 1000 | 1000 |
| External VOL | Source : Supported Target : Supported | Source : Supported (V07 or higher) |
| Saving Differential Bitmap | Save to SVP | Save to SVP |

Table 24 Basic Mainframe functional differences (continued)

| Feature | P9500 | XP24000/XP20000 Disk Array |
|---------------------|--|---|
| Supported OS | OS/390 V2/R10 or higher /OS V1R0 or higher z/VM V5R3 or higher z/VSE V4R1 or higher | OS/390 V2/R10 or higher z/OS V1R0 or higher z/VM V5R3 or higher z/VSE V4R1 or higher |
| Operation Interface | TSO ICKDSF DFSMSdss ANTRQS | TSO ICKDSF DFSMSdss ANTRQS |

Table 25 Functional differences - Business Copy Z

| . | Feature | P9500 | XP24000/XP20000 Disk Array |
|-------------------|--|---|---|
| Basic Functions | DKC Emulation Type | 2105 2107 | 3990 2105 2107 |
| | Drive Emulation Type | 3380-3 3390-1/2/3/3R/9/L/M | 3380-3 3390-1/2/3/3R/9/L/M |
| | The biggest size of pair creatable volume. | 3390-M | 3390-M |
| | Maximum number of pairs in system | 16k | 16k |
| | Maximum number of CTGs in system | 256 | 256 |
| | Maximum number of pairs in one CTG | 8192 | 8192 |
| | Saving Differential Bitmap | Save to SSD | Save to SVP Save to SYSTEM DISK |
| | Interface | Remote Web Console PPRC Business Copy Z | Remote Web Console PPRC Business Copy Z |
| Expanded Function | Pair configuration | 1:11:N (N<=3) | 1:11:N (N<=3) |
| | At-Time Split Function | Supported | Supported |

Table 26 Functional differences - Business Copy for Open Systems

| . | Feature | P9500 | XP24000/XP20000 Disk Array |
|---|--|--|--|
| | Drive Emulation Type | Open-3, Open-8, Open-9 Open-E, Open-L, Open-V | Open-3, Open-8, Open-9 Open-E, Open-L, Open-V |
| | Host I/F | Fibre | Fibre |
| | Maximum size of pair creatable volume. | Open-V 4 TB | Open-V 4 TB |
| | Maximum number of pairs in system | 16k Pair | 16k Pair |

Table 26 Functional differences - Business Copy for Open Systems *(continued)*

| . | Feature | P9500 | XP24000/XP20000 Disk Array |
|-------------------|-----------------------------------|---|---|
| | Maximum number of CTG in system | 256CTG | 256CTG |
| | Maximum number of pair in one CTG | 8192 Pair | 8192 Pair |
| | Saving differential bitmap | Save to SSD | Save to SVPSave to SYSTEM DISK |
| | Operation interface | Remote Web Console RAID Manager (Inband) RAID Manager (Outband) | Remote Web Console RAID Manager (Inband) |
| Expanded Function | Pair configuration | 1:1 Cascade pair 1:N (N <= 3) | 1:1 Cascade pair 1:N (N <= 3) |

B Specifications

Mechanical specifications

The following table lists the mechanical specifications of the P9500 disk array.

Table 27 P9500 mechanical specifications

| Dimension | | Single Rack | Single Module (3 racks) | Dual Module (6 racks) |
|----------------------|----------------|-----------------------|--|--------------------------|
| Width (inches / mm) | | 24.0 / 610 | 71.3 / 1810 | 142 / 3610 |
| Depth (inches / mm) | | 45 / 1145 | 45 / 1145 | 45 / 1145 |
| Height (inches / mm) | | 79 / 2006 | 79 / 2006 | 79 / 2006 |
| System Weight | Min (lbs / kg) | 1120 / 508 (Diskless) | 3750 / 1701 | 7500 / 3402 |
| | Max (lbs / kg) | 1558 / 707 | 4319 / 1959 | 8560 / 3883 |
| Rack Weight | (lbs / kg) | 292.6 / 133 | Rack Weight is included in system weight | |

Electrical specifications

The P9500 supports single-phase and three-phase power. Power consumption and heat dissipation is independent of input power.

“System heat and power specifications” (page 80) lists system heat and power specifications.

“System components heat and power specifications ” (page 81) lists component heat and power specifications.

“AC power - PDU options” (page 82) lists the PDU specifications for both single phase and three phase power.

System heat and power specifications

Table 28 System heat and power specifications

| | Parameter ^{1, 2} | DKC Module-0 | DKC Module-1 | DKU Rack | Full Array (DKC-0 plus DKC-1 plus DKU x4) |
|---|-----------------------------|--------------|--------------|----------|---|
| Heat Dissipation and Power Consumption Specifications (Maximum configuration) | Max Power consumption (kVA) | 5.87 | 5.42 | 5.45 | 33.1 |
| | Max Heat dissipation (kW) | 5.57 | 5.15 | 5.17 | 31.4 |
| | Max BTUs per hour | 19012 | 17571 | 17643 | 107155 |
| | Max Kcal per hour | 4791 | 4428 | 4446 | 27002 |
| ¹ Heat (KW, BTU, Kcal) and Power (kVA) values are for determining load for site planning. Actual heat generation and power demand may be less. | | | | | |
| ² Calculated values with drives at a typical I/O condition. (Random Read and Write, 50 IOPSs for HDD, 2500 IOPSs for SSD, Data Length: 8Kbytes). These values may increase for future compatible drives. | | | | | |

System components heat and power specifications

Table 29 System components heat and power specifications

| Component Product Number | HP XP P9500 Disk Array Component | Heat Output (kW) ¹ | Power Consumption (kVA) ¹ |
|--------------------------|----------------------------------|-------------------------------|--------------------------------------|
| AV375A | Flash Module Chassis | 0.600 ⁴ | 0.640 ⁴ |
| AV392A, AV393A | Flash Module | 0.017 ³ | 0.018 ³ |
| AV400A | Disk Array DKC Module-0 Rack | 1.88 | 1.97 |
| AV401A, AV401B | DKC Module-1 Rack | 1.83 | 1.93 |
| AV402A, AV402B | DKU Disk Unit Rack | 1.47 | 1.54 |
| AV411B | Base 2.5in Drive Chassis | see note 5 | see note 5 |
| AV412B | Complete 2.5in Drive Chassis | 0.57 | 0.600 |
| AV413A | Drive Chassis SAS Switch Kit | 0.120 | 0.103 |
| AV423A, AV423B | 8-port 2-8 Gbps FC CHA | 0.072 | 0.076 |
| AV424A, AV424B | 16-port 2-8 Gbps FC CHA | 0.072 | 0.076 |
| AV425A | 16p 1-4 Gbps SW FICON CHA | 0.118 | 0.124 |
| AV426A | 16p 1-4 Gbps LW FICON CHA | 0.118 | 0.124 |
| AV427A, AV427B | 16p 2-8 Gbps SW FICON CHA | 0.072 | 0.076 |
| AV428A | 16p 2-8 Gbps LW FICON CHA | 0.072 | 0.076 |
| AV429A | P9500 8-port 10 Gbps FCoE CHA | 0.072 | 0.076 |
| AV440A, AV440B | Processor Blade | 0.19 | 0.200 |
| AV442A | DKC Hub Kit | 0.010 | 0.010 |
| AV443A | 2nd SVP High Reliability Kit | 0.052 | 0.055 |
| AV444A | Cache Memory Adapter | 0.068 | 0.072 |
| AV447A, AV447B | 16GB Cache Memory Module | 0.019 | 0.020 |
| AV448A, AV448B | 32GB Cache Memory Module | 0.019 | 0.020 |
| AV451A | 64GB Cache Backup Memory Module | 0.005 ² | 0.005 ² |
| AV452A | 128GB Cache Backup Memory Module | 0.005 ² | 0.005 ² |
| AV455A | SAS DKA Drive Adapter | 0.08 | 0.084 |
| AV458A | Express Switch Adapter | 0.07 | 0.074 |
| AV467A | 500GB 6G SAS 7.2K 2.5in DP HDD | 0.0070 ³ | 0.0074 ³ |
| AV468A | 1TB SAS 7.2K 2.5in DP HDD | 0.0082 ³ | 0.0087 ³ |
| AV474A | 300GB SAS 10K 2.5in DP HDD | 0.0079 ³ | 0.0083 ³ |
| AV475A | 600GB SAS 10K 2.5in DP HDD | 0.0080 ³ | 0.0085 ³ |
| AV476A | 900GB SAS 10K 2.5in DP HDD | 0.0090 ³ | 0.0095 ³ |
| AV477A | 1.2 TB SAS 10K 2.5in DP HDD | 0.0083 ³ | 0.0087 ³ |
| AV482A | 146GB SAS 15K 2.5in DP HDD | 0.0080 ³ | 0.0084 ³ |
| AV483A | 300GB SAS 15K 2.5in DP HDD | 0.0086 ³ | 0.0090 ³ |
| AV490A | 200GB SAS 2.5in DP SLC SSD | 0.0127 ³ | 0.0134 ³ |

Table 29 System components heat and power specifications *(continued)*

| Component Product Number | HP XP P9500 Disk Array Component | Heat Output (kW) ¹ | Power Consumption (kVA) ¹ |
|--------------------------|----------------------------------|-------------------------------|--------------------------------------|
| AV491A | 400GB SAS 2.5in DP SLC SSD | 0.0023 ³ | 0.0024 ³ |
| AV492A | 200GB SAS 2.5in DP MLC SSD | 0.0026 ³ | 0.0028 ³ |
| AV493A | 400GB SAS 2.5in DP MLC SSD | 0.0026 ³ | 0.0028 ³ |
| AV494A | 800GB SAS 2.5in DP MLC SSD | 0.0067 ³ | 0.0071 ³ |

¹ Heat (KW, BTU, Kcal) and Power (kVA) values are for determining rated load for site planning. Actual heat generation and power demand may be less.

² Power is consumed during the battery back-up time only.

³ Actual values at a typical I/O condition. (Random Read and Write, 50 IOPSs for HDD, 2500 IOPSs for SSD, Data Length: 8Kbytes). These values may increase for future compatible drives.

⁴ Maximum values with all fans rotate at maximum.

⁵ AV411B Base 2.5in Drive Chassis does not include power supplies consequently demands zero (0) kVA and generates no (0) kW heat.

AC power - PDU options

P9500 is configured for input power using separate rackmount PDU products. PDUs are available for three phase or single phase power for NEMA and IEC compliance applications.

Table 30 P9500 AC PDU options

| Product Number | Local Power | Number of PDU per Rack ¹ | Branch circuit requirements per PDU | Plug Type | Facility receptacle needed | Notes |
|-------------------|-------------------|-------------------------------------|--|---|---|---|
| AV404A AV404AU | 3 phase (4 wire) | 2 | 208-240V, 3Ø, 4-wire, 30A | NEMA L15-30P | NEMA L15-30R | For customers with, 208 - 240 VAC, 3-Phase, 4-Wire Power Distribution System |
| AV405A AV405AU | 3 phase (5 wire) | 2 | 380-415V, 3Ø, 5-wire, 16A Category D Breaker | IEC60309 4 pole, 5-wire 380-415VAC, 16A | IEC60309 4 pole, 5-wire, 380-415 VAC, 16A | For customers with 380 - 415 VAC, Three-Phase, 5-Wire Wye Power Distribution System |
| AV406A AV406AU | single phase NEMA | 4 | 200-240V, 1Ø, 3-wire, 30A | NEMA L6-30P | NEMA L6-30R | For customers with single phase power and need NEMA L6-30P plug |
| AV407A AV407AU | single phase IEC | 4 | 200-240V, 1Ø, 3-wire, 32A Category D Breaker | IEC60309 2 pole, 3-wire, 240VAC, 32A | IEC60309 2 pole, 3-wire, 240VAC, 32A | For customers with single phase power and need IEC60309 32A plug |

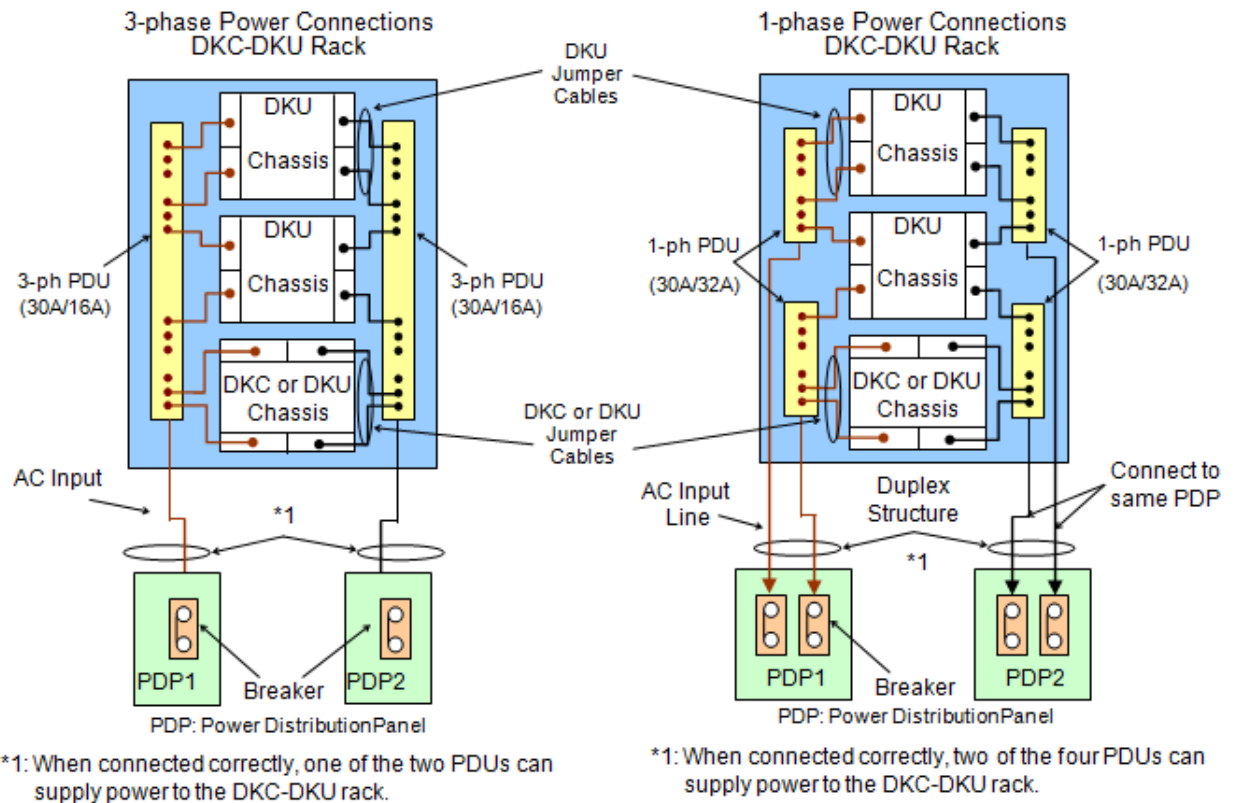
Notes:

- Each PDU has one fixed power cord with attached plug. Power cord is not removable.

NOTE: PDU models can be changed in the field using offline maintenance procedures.

NOTE: When ordering systems, HP does not allow mixtures of different phase PDUs in a system (even though there are no technical issues). Only upgrade orders can ship with difference phase PDUs in a system.

Figure 23 P9500 AC power configuration diagram



Environmental specifications

The following table lists the environmental specifications of the P9500 storage system.

Table 31 P9500 environmental specifications

| Item | Operating | Not Operating | In Storage |
|--|---------------------------------------|---|--|
| Temperature (°F / °C) | 60.8 - 80.9 / 16 to 32 | -18 - 109.4 / -10 to 43 -18 to 95 / -10 to 35 ⁸ | -45 - 140 -25 to 60 |
| Relative Humidity (%) ² | 20 to 80 | 8 to 90 | 5 to 95 |
| Max. Wet Bulb (°F / °C) | 78.8 / 26 | 80.6 / 27 | 84.2 / 29 |
| Temperature Deviation per hour) (°F / °C) | 50 / 10 | 50 / 10 | 68 / 20 |
| Vibration to 10Hz: 0.25 mm | 10 to 300 Hz 0.49 m/s ¹ | 5 to 10 Hz: 2.5 mm 10 to 70 Hz: 4.9 m/s ¹ | Sine Vibration: 4.9 m/s ¹ , 5 min. |

Table 31 P9500 environmental specifications *(continued)*

| Item | Operating | Not Operating | In Storage |
|---|------------------------|--|---|
| | | 70 to 99 Hz: 0.05 mm 99 to 300 Hz: 9.8 m/s ¹ | At the resonant frequency with the highest displacement found between 3 to 100 Hz ³ Random Vibration: 0.147 m ² /s ³ 30 min, 5 to 100 Hz ⁴ |
| Earthquake resistance (m/s ²) | Up to 2.5 ⁷ | - | - |
| Shock | - | 78.4 m/s ¹ , 15 ms | Horizontal: Incline Impact 1.22 m/s ⁵ Vertical: Rotational Edge 0.15 m ⁶ |
| Altitude | -60 m to 3,000 m | | - |

Notes:

1. Recommended temperature range is 21 to 24°C

2. On shipping/storage condition, the product should be packed with factory packing

3. The above specifications of vibration are applied to all three axes

4. See ASTM D999-01 The Methods for Vibration Testing of Shipping Containers.

5. See ASTM D5277-92 Test Method for Performing Programmed Horizontal Impacts Using an Inclined Impact Tester.

6. See ASTM D6055-96 Test Methods for Mechanical Handling of Unitized Loads and Large Shipping Cases and Crates.

7. Time is 5 seconds or less in case of the testing with device resonance point (6 to 7Hz).

8. When flash modules are installed in the system.

C Regulatory compliance notices

This section contains regulatory notices for the HP HP P9500 Disk Array.

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, this product has been assigned a unique regulatory model number. The regulatory model number can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this regulatory model number. The regulatory model number is not the marketing name or model number of the product.

Product specific information:

HP P9500 Disk Array

Regulatory model number: CSPRA-0390

FCC and CISPR classification: Class A

These products contain laser components. See Class 1 laser statement in the [Laser compliance notices](#) section.

Federal Communications Commission notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

FCC rating label

The FCC rating label on the device shows the classification (A or B) of the equipment. Class B devices have an FCC logo or ID on the label. Class A devices do not have an FCC logo or ID on the label. After you determine the class of the device, refer to the corresponding statement.

Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Class B equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment

off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit that is different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Declaration of Conformity for products marked with the FCC logo, United States only

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company P.O. Box 692000, Mail Stop 510101 Houston, Texas 77269-2000
- Or call 1-281-514-3333

Modification

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

When provided, connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Canadian notice (Avis Canadien)

Class A equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la class A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Class B equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.


European Union notice

This product complies with the following EU directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:

| | |
|---|--|
|  | This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g., Bluetooth). |
|---|--|

Certificates can be obtained from <http://www.hp.com/go/certificates>.

Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany

Japanese notices

Japanese VCCI-A notice

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

Japanese VCCI-B notice

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用するを目的としています。この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。 VCCI-B

Japanese VCCI marking



Japanese power cord statement

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Please use the attached power cord.
The attached power cord is not allowed to use with other product.

Korean notices

Class A equipment

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니
판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약
잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기
바랍니다.

Class B equipment

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서
주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

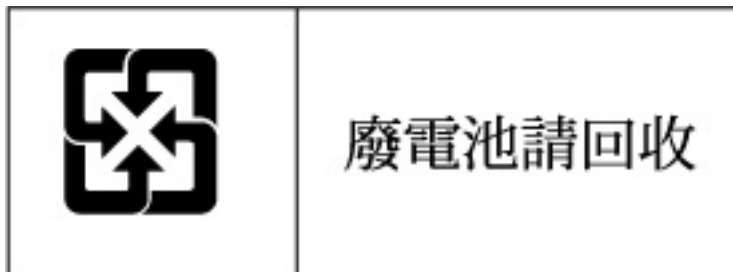
Taiwanese notices

BSMI Class A notice

警告使用者:

這是甲類的資訊產品，在居住的
環境中使用時，可能會造成射頻
干擾，在這種情況下，使用者會
被要求採取某些適當的對策。

Taiwan battery recycle statement



Turkish recycling notice



Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Laser compliance notices

English laser notice

This device may contain a laser that is classified as a Class 1 Laser Product in accordance with U.S. FDA regulations and the IEC 60825-1. The product does not emit hazardous laser radiation.



WARNING! Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product's installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation:

- Do not try to open the module enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only HP Authorized Service technicians to repair the unit.

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

Dutch laser notice



WAARSCHUWING: dit apparaat bevat mogelijk een laser die is geclassificeerd als een laserproduct van Klasse 1 overeenkomstig de bepalingen van de Amerikaanse FDA en de richtlijn IEC 60825-1. Dit product geeft geen gevaarlijke laserstraling af.

Als u bedieningselementen gebruikt, instellingen aanpast of procedures uitvoert op een andere manier dan in deze publicatie of in de installatiehandleiding van het laserproduct wordt aangegeven, loopt u het risico te worden blootgesteld aan gevaarlijke straling. Het risico van blootstelling aan gevaarlijke straling beperkt u als volgt:

- Probeer de behuizing van de module niet te openen. U mag zelf geen onderdelen repareren.
- Gebruik voor de laserapparatuur geen andere knoppen of instellingen en voer geen andere aanpassingen of procedures uit dan die in deze handleiding worden beschreven.
- Alleen door HP geautoriseerde technici mogen het apparaat repareren.

French laser notice



AVERTISSEMENT : cet appareil peut être équipé d'un laser classé en tant que Produit laser de classe 1 et conforme à la réglementation de la FDA américaine et à la norme 60825-1 de l'IEC. Ce produit n'émet pas de rayonnement dangereux.

L'utilisation de commandes, de réglages ou de procédures autres que ceux qui sont indiqués ici ou dans le manuel d'installation du produit laser peut exposer l'utilisateur à des rayonnements dangereux. Pour réduire le risque d'exposition à des rayonnements dangereux :

- Ne tentez pas d'ouvrir le boîtier renfermant l'appareil laser. Il ne contient aucune pièce dont la maintenance puisse être effectuée par l'utilisateur.
- Tout contrôle, réglage ou procédure autre que ceux décrits dans ce chapitre ne doivent pas être effectués par l'utilisateur.
- Seuls les Mainteneurs Agréés HP sont habilités à réparer l'appareil laser.

German laser notice



VORSICHT: Dieses Gerät enthält möglicherweise einen Laser, der nach den US-amerikanischen FDA-Bestimmungen und nach IEC 60825-1 als Laserprodukt der Klasse 1 zertifiziert ist. Gesundheitsschädliche Laserstrahlen werden nicht emittiert.

Die Anleitungen in diesem Dokument müssen befolgt werden. Bei Einstellungen oder Durchführung sonstiger Verfahren, die über die Anleitungen in diesem Dokument bzw. im Installationshandbuch des Lasergeräts hinausgehen, kann es zum Austritt gefährlicher Strahlung kommen. Zur Vermeidung der Freisetzung gefährlicher Strahlungen sind die folgenden Punkte zu beachten:

- Versuchen Sie nicht, die Abdeckung des Lasermoduls zu öffnen. Im Inneren befinden sich keine Komponenten, die vom Benutzer gewartet werden können.
 - Benutzen Sie das Lasergerät ausschließlich gemäß den Anleitungen und Hinweisen in diesem Dokument.
 - Lassen Sie das Gerät nur von einem HP Servicepartner reparieren.
-

Italian laser notice



AVVERTENZA: AVVERTENZA. Questo dispositivo può contenere un laser classificato come prodotto laser di Classe 1 in conformità alle normative US FDA e IEC 60825-1. Questo prodotto non emette radiazioni laser pericolose.

L'eventuale esecuzione di comandi, regolazioni o procedure difformi a quanto specificato nella presente documentazione o nella guida di installazione del prodotto può causare l'esposizione a radiazioni nocive. Per ridurre i rischi di esposizione a radiazioni pericolose, attenersi alle seguenti precauzioni:

- Non cercare di aprire il contenitore del modulo. All'interno non vi sono componenti soggetti a manutenzione da parte dell'utente.
 - Non eseguire operazioni di controllo, regolazione o di altro genere su un dispositivo laser ad eccezione di quelle specificate da queste istruzioni.
 - Affidare gli interventi di riparazione dell'unità esclusivamente ai tecnici dell'Assistenza autorizzata HP.
-

Japanese laser notice



警告: 本製品には、US FDA規則およびIEC 60825-1に基づくClass 1レーザー製品が含まれている場合があります。本製品は人体に危険なレーザー光は発しません。

本書およびレーザー製品のインストールガイドに示されている以外の方法で制御、調整、使用した場合、人体に危険な光線にさらされる場合があります。人体に危険な光線にさらされないため、以下の項目を守ってください。

- モジュール エンクロージャを開けないでください。ユーザーが取り扱えるコンポーネントは含まれていません。
- 本書に示されている以外の方法で、レーザー デバイスを制御、調整、使用しないでください。
- HPの正規サービス技術者のみが本ユニットの修理を許可されています。

Spanish laser notice



ADVERTENCIA: Este dispositivo podría contener un láser clasificado como producto de láser de Clase 1 de acuerdo con la normativa de la FDA de EE.UU. e IEC 60825-1. El producto no emite radiaciones láser peligrosas.

El uso de controles, ajustes o manipulaciones distintos de los especificados aquí o en la guía de instalación del producto de láser puede producir una exposición peligrosa a las radiaciones. Para evitar el riesgo de exposición a radiaciones peligrosas:

- No intente abrir la cubierta del módulo. Dentro no hay componentes que el usuario pueda reparar.
- No realice más operaciones de control, ajustes o manipulaciones en el dispositivo láser que los aquí especificados.
- Sólo permita reparar la unidad a los agentes del servicio técnico autorizado HP.

Recycling notices

English recycling notice

Disposal of waste equipment by users in private household in the European Union



This symbol means do not dispose of your product with your other household waste. Instead, you should protect human health and the environment by handing over your waste equipment to a designated collection point for the recycling of waste electrical and electronic equipment. For more information, please contact your household waste disposal service

Bulgarian recycling notice

Изхвърляне на отпадъчно оборудване от потребители в частни домакинства в Европейския съюз



Този символ върху продукта или опаковката му показва, че продуктът не трябва да се изхвърля заедно с другите битови отпадъци. Вместо това, трябва да предпазите човешкото здраве и околната среда, като предадете отпадъчното оборудване в предназначен за събирането му пункт за рециклиране на неизползваемо електрическо и електронно борудване. За допълнителна информация се свържете с фирмата по чистота, чиито услуги използвате.

Czech recycling notice

Likvidace zařízení v domácnostech v Evropské unii



Tento symbol znamená, že nesmíte tento produkt likvidovat spolu s jiným domovním odpadem. Místo toho byste měli chránit lidské zdraví a životní prostředí tím, že jej předáte na k tomu určené sběrné pracoviště, kde se zabývají recyklací elektrického a elektronického vybavení. Pro více informací kontaktujte společnost zabývající se sběrem a svozem domovního odpadu.

Danish recycling notice

Bortskaffelse af brugt udstyr hos brugere i private hjem i EU



Dette symbol betyder, at produktet ikke må bortskaffes sammen med andet husholdningsaffald. Du skal i stedet den menneskelige sundhed og miljøet ved at afl evere dit brugte udstyr på et dertil beregnet indsamlingssted for af brugt, elektrisk og elektronisk udstyr. Kontakt nærmeste renovationsafdeling for yderligere oplysninger.

Dutch recycling notice

Inzameling van afgedankte apparatuur van particuliere huishoudens in de Europese Unie



Dit symbool betekent dat het product niet mag worden gedeponeerd bij het overige huishoudelijke afval. Bescherm de gezondheid en het milieu door afgedankte apparatuur in te leveren bij een hiervoor bestemd inzamelpunt voor recycling van afgedankte elektrische en elektronische apparatuur. Neem voor meer informatie contact op met uw gemeentereinigingsdienst.

Estonian recycling notice

Äravisatavate seadmete likvideerimine Euroopa Liidu eramajapidamistes



See märk näitab, et seadet ei tohi visata olmeprügi hulka. Inimeste tervise ja keskkonna säästmise nimel tuleb äravisatav toode tuua elektriliste ja elektrooniliste seadmete käitlemisega egelevasse kogumispunkti. Küsimuste korral pöörduge kohaliku prügikäitlusettevõtte poole.



Finnish recycling notice

Kotitalousjätteiden hävittäminen Euroopan unionin alueella



Tämä symboli merkitsee, että laitetta ei saa hävittää muiden kotitalousjätteiden mukana. Sen sijaan sinun on suojattava ihmisten terveyttä ja ympäristöä toimittamalla käytöstä poistettu laite sähkö- tai elektroniikkajätteen kierrätyspisteeseen. Lisätietoja saat jätehuoltoyhtiöltä.



French recycling notice

Mise au rebut d'équipement par les utilisateurs privés dans l'Union Européenne



Ce symbole indique que vous ne devez pas jeter votre produit avec les ordures ménagères. Il est de votre responsabilité de protéger la santé et l'environnement et de vous débarrasser de votre équipement en le remettant à une déchetterie effectuant le recyclage des équipements électriques et électroniques. Pour de plus amples informations, prenez contact avec votre service d'élimination des ordures ménagères.



German recycling notice

Entsorgung von Altgeräten von Benutzern in privaten Haushalten in der EU



Dieses Symbol besagt, dass dieses Produkt nicht mit dem Haushaltsmüll entsorgt werden darf. Zum Schutze der Gesundheit und der Umwelt sollten Sie stattdessen Ihre Altgeräte zur Entsorgung einer dafür vorgesehenen Recyclingstelle für elektrische und elektronische Geräte übergeben. Weitere Informationen erhalten Sie von Ihrem Entsorgungsunternehmen für Hausmüll.



Greek recycling notice

Απόρριψη άχρηστου εξοπλισμού από ιδιώτες χρήστες στην Ευρωπαϊκή Ένωση



Αυτό το σύμβολο σημαίνει ότι δεν πρέπει να απορρίψετε το προϊόν με τα λοιπά οικιακά απορρίμματα. Αντίθετα, πρέπει να προστατέψετε την ανθρώπινη υγεία και το περιβάλλον παραδίδοντας τον άχρηστο εξοπλισμό σας σε εξουσιοδοτημένο σημείο συλλογής για την ανακύκλωση άχρηστου ηλεκτρικού και ηλεκτρονικού εξοπλισμού. Για περισσότερες πληροφορίες, επικοινωνήστε με την υπηρεσία απόρριψης απορριμμάτων της περιοχής σας.

Hungarian recycling notice

A hulladék anyagok megsemmisítése az Európai Unió háztartásaiban



Ez a szimbólum azt jelzi, hogy a készüléket nem szabad a háztartási hulladékkal együtt kidobni. Ehelyett a leselejtezett berendezéseknek az elektromos vagy elektronikus hulladék átvételére kijelölt helyen történő besolgáltatásával megóvja az emberi egészséget és a környezetet. További információt a helyi köztisztasági vállalatától kaphat.

Italian recycling notice

Smaltimento di apparecchiature usate da parte di utenti privati nell'Unione Europea



Questo simbolo avvisa di non smaltire il prodotto con i normali rifiuti domestici. Rispettare la salute umana e l'ambiente conferendo l'apparecchiatura dismessa a un centro di raccolta designato per il riciclo di apparecchiature elettroniche ed elettriche. Per ulteriori informazioni, rivolgersi al servizio per lo smaltimento dei rifiuti domestici.

Latvian recycling notice

Europos Sąjungos namų ūkio vartotojų įrangos atliekų šalinimas



Šis simbolis nurodo, kad gaminio negalima išmesti kartu su kitomis buitinėmis atliekomis. Kad apsaugotumėte žmonių sveikatą ir aplinką, pasenusią nenaudojamą įrangą turite nuvežti į elektrinių ir elektroninių atliekų surinkimo punktą. Daugiau informacijos teiraukitės buitinių atliekų surinkimo tarnybos.

Lithuanian recycling notice

Nolietotu iekārtu iznīcināšanas noteikumi lietotājiem Eiropas Savienības privātajās mājāsaimniecībās



Šis simbols norāda, ka ierīci nedrīkst utilizēt kopā ar citiem mājāsaimniecības atkritumiem. Jums jā rūpējas par cilvēku veselības un vides aizsardzību, nododot lietoto aprīkojumu otrreizējai pārstrādei īpašā lietotu elektrisko un elektronisko ierīču savākšanas punktā. Lai iegūtu plašāku informāciju, lūdzu, sazinieties ar savu mājāsaimniecības atkritumu likvidēšanas dienestu.

Polish recycling notice

Utylizacja zużytego sprzętu przez użytkowników w prywatnych gospodarstwach domowych w krajach Unii Europejskiej



Ten symbol oznacza, że nie wolno wyrzucać produktu wraz z innymi domowymi odpadkami. Obowiązkiem użytkownika jest ochrona zdrowia ludzkiego i środowiska przez przekazanie zużytego sprzętu do wyznaczonego punktu zajmującego się recyklingiem odpadów powstałych ze sprzętu elektrycznego i elektronicznego. Więcej informacji można uzyskać od lokalnej firmy zajmującej wywozem nieczystości.

Portuguese recycling notice

Descarte de equipamentos usados por utilizadores domésticos na União Europeia



Este símbolo indica que não deve descartar o seu produto juntamente com os outros lixos domiciliares. Ao invés disso, deve proteger a saúde humana e o meio ambiente levando o seu equipamento para descarte em um ponto de recolha destinado à reciclagem de resíduos de equipamentos eléctricos e electrónicos. Para obter mais informações, contacte o seu serviço de tratamento de resíduos domésticos.

Romanian recycling notice

Casarea echipamentului uzat de către utilizatorii casnici din Uniunea Europeană



Acest simbol înseamnă să nu se arunce produsul cu alte deșeuri menajere. În schimb, trebuie să protejați sănătatea umană și mediul predând echipamentul uzat la un punct de colectare desemnat pentru reciclarea echipamentelor electrice și electronice uzate. Pentru informații suplimentare, vă rugăm să contactați serviciul de eliminare a deșeurilor menajere local.

Slovak recycling notice

Likvidácia vyradených zariadení používateľmi v domácnostiach v Európskej únii



Tento symbol znamená, že tento produkt sa nemá likvidovať s ostatným domovým odpadom. Namiesto toho by ste mali chrániť ľudské zdravie a životné prostredie odovzdaním odpadového zariadenia na zbernom mieste, ktoré je určené na recykláciu odpadových elektrických a elektronických zariadení. Ďalšie informácie získate od spoločnosti zaoberajúcej sa likvidáciou domového odpadu.

Spanish recycling notice

Eliminación de los equipos que ya no se utilizan en entornos domésticos de la Unión Europea



Este símbolo indica que este producto no debe eliminarse con los residuos domésticos. En lugar de ello, debe evitar causar daños a la salud de las personas y al medio ambiente llevando los equipos que no utilice a un punto de recogida designado para el reciclaje de equipos eléctricos y electrónicos que ya no se utilizan. Para obtener más información, póngase en contacto con el servicio de recogida de residuos domésticos.

Swedish recycling notice

Hantering av elektroniskt avfall för hemanvändare inom EU



Den här symbolen innebär att du inte ska kasta din produkt i hushållsavfallet. Värna i stället om natur och miljö genom att lämna in uttjänt utrustning på anvisad samlingsplats. Allt elektriskt och elektroniskt avfall går sedan vidare till återvinning. Kontakta ditt återvinningsföretag för mer information.

Battery replacement notices

Dutch battery notice

Verklaring betreffende de batterij



WAARSCHUWING: dit apparaat bevat mogelijk een batterij.

- Probeer de batterijen na het verwijderen niet op te laden.
- Stel de batterijen niet bloot aan water of temperaturen boven 60° C.
- De batterijen mogen niet worden beschadigd, gedemonteerd, geplet of doorboord.
- Zorg dat u geen kortsluiting veroorzaakt tussen de externe contactpunten en laat de batterijen niet in aanraking komen met water of vuur.
- Gebruik ter vervanging alleen door HP goedgekeurde batterijen.

Batterijen, accu's en accumulators mogen niet worden gedeponeerd bij het normale huishoudelijke afval. Als u de batterijen/accu's wilt inleveren voor hergebruik of op de juiste manier wilt vernietigen, kunt u gebruik maken van het openbare inzamelingssysteem voor klein chemisch afval of ze terugsturen naar HP of een geautoriseerde HP Business of Service Partner.

Neem contact op met een geautoriseerde leverancier of een Business of Service Partner voor meer informatie over het vervangen of op de juiste manier vernietigen van accu's.

Avis relatif aux piles



AVERTISSEMENT : cet appareil peut contenir des piles.

- N'essayez pas de recharger les piles après les avoir retirées.
- Évitez de les mettre en contact avec de l'eau ou de les soumettre à des températures supérieures à 60°C.
- N'essayez pas de démonter, d'écraser ou de percer les piles.
- N'essayez pas de court-circuiter les bornes de la pile ou de jeter cette dernière dans le feu ou l'eau.
- Remplacez les piles exclusivement par des pièces de rechange HP prévues pour ce produit.

Les piles, modules de batteries et accumulateurs ne doivent pas être jetés avec les déchets ménagers. Pour permettre leur recyclage ou leur élimination, veuillez utiliser les systèmes de collecte publique ou renvoyez-les à HP, à votre Partenaire Agréé HP ou aux agents agréés.

Contactez un Revendeur Agréé ou Mainteneur Agréé pour savoir comment remplacer et jeter vos piles.

Hinweise zu Batterien und Akkus



VORSICHT: Dieses Produkt enthält unter Umständen eine Batterie oder einen Akku.

- Versuchen Sie nicht, Batterien und Akkus außerhalb des Gerätes wieder aufzuladen.
- Schützen Sie Batterien und Akkus vor Feuchtigkeit und Temperaturen über 60°.
- Verwenden Sie Batterien und Akkus nicht missbräuchlich, nehmen Sie sie nicht auseinander und vermeiden Sie mechanische Beschädigungen jeglicher Art.
- Vermeiden Sie Kurzschlüsse, und setzen Sie Batterien und Akkus weder Wasser noch Feuer aus.
- Ersetzen Sie Batterien und Akkus nur durch die von HP vorgesehenen Ersatzteile.

Batterien und Akkus dürfen nicht über den normalen Hausmüll entsorgt werden. Um sie der Wiederverwertung oder dem Sondermüll zuzuführen, nutzen Sie die öffentlichen Sammelstellen, oder setzen Sie sich bezüglich der Entsorgung mit einem HP Partner in Verbindung.

Weitere Informationen zum Austausch von Batterien und Akkus oder zur sachgemäßen Entsorgung erhalten Sie bei Ihrem HP Partner oder Servicepartner.

Istruzioni per la batteria



AVVERTENZA: Questo dispositivo può contenere una batteria.

- Non tentare di ricaricare le batterie se rimosse.
- Evitare che le batterie entrino in contatto con l'acqua o siano esposte a temperature superiori a 60° C.
- Non smontare, schiacciare, forare o utilizzare in modo improprio la batteria.
- Non accorciare i contatti esterni o gettare in acqua o sul fuoco la batteria.
- Sostituire la batteria solo con i ricambi HP previsti a questo scopo.

Le batterie e gli accumulatori non devono essere smaltiti insieme ai rifiuti domestici. Per procedere al riciclaggio o al corretto smaltimento, utilizzare il sistema di raccolta pubblico dei rifiuti o restituirli a HP, ai Partner Ufficiali HP o ai relativi rappresentanti.

Per ulteriori informazioni sulla sostituzione e sullo smaltimento delle batterie, contattare un Partner Ufficiale o un Centro di assistenza autorizzato.

Japanese battery notice

バッテリーに関する注意



警告: 本製品はバッテリーを内蔵している場合があります。

- バッテリーを取り外している場合は、充電しないでください。
- バッテリーを水にさらしたり、60°C (140°F) 以上の温度にさらさないでください。
- バッテリーを誤用、分解、破壊したり、穴をあけたりしないでください。
- 外部極を短絡させたり、火や水に投棄しないでください。
- バッテリーを交換する際は、HP指定の製品と交換してください。

バッテリー、バッテリーパック、蓄電池は一般の家庭廃棄物と一緒に廃棄しないでください。リサイクルまたは適切に廃棄するため、公共の収集システム、HP、HPパートナー、またはHPパートナーの代理店にお送りください。

バッテリー交換および適切な廃棄方法についての情報は、HPのサポート窓口にお問い合わせください。

Declaración sobre las baterías



ADVERTENCIA: Este dispositivo podría contener una batería.

- No intente recargar las baterías si las extrae.
 - Evite el contacto de las baterías con agua y no las exponga a temperaturas superiores a los 60 °C (140 °F).
 - No utilice incorrectamente, ni desmonte, aplaste o pinche las baterías.
 - No cortocircuite los contactos externos ni la arroje al fuego o al agua.
 - Sustituya las baterías sólo por el repuesto designado por HP.
-

Las baterías, los paquetes de baterías y los acumuladores no se deben eliminar junto con los desperdicios generales de la casa. Con el fin de tirarlos al contenedor de reciclaje adecuado, utilice los sistemas públicos de recogida o devuélvalas a HP, un distribuidor autorizado de HP o sus agentes.

Para obtener más información sobre la sustitución de la batería o su eliminación correcta, consulte con su distribuidor o servicio técnico autorizado.

Glossary

| | |
|----------------------------|--|
| access method | An IBM-specific term for software that moves data between main storage and I/O devices to create channel programs and manage system buffers. |
| AL | Arbitrated loop. |
| allocation | The ratio of allocated storage capacity versus total capacity as a percentage. Allocated storage refers to those logical devices (LDEVs) that have paths assigned to them. Allocated storage capacity is the sum of the storage of these LDEVs. Total capacity is the sum of the capacity of all LDEVs on the disk array. |
| ambient temperature | The air temperature in the area where a system is installed. Also called <i>intake temperature</i> or <i>room temperature</i> . |
| array group | A group of four or eight physical hard disk drives (HDDs) installed in a P9000 or XP disk array and assigned a common RAID level. RAID1 array groups consist of four (2D+2D) or eight HDDs (4D+4D). RAID5 array groups include a parity disk, but also consist of four (3D+1P) or eight HDDs (7D+1P). All RAID6 array groups are made up of eight HDDs (6D+2P). This is also known as a <i>parity group</i> or a <i>RAID group</i> . |
| BC | P9000 or XP Business Copy. An HP application that provides volume-level, point-in-time copies in the disk array. |
| BC Z | The version of Business Copy that supports mainframe volumes. |
| CB | Circuit Breaker. |
| CHA | Channel adapter. A device that provides the interface between the array and the external host system. Occasionally, this term is used synonymously with the term channel host interface processor (CHIP). |
| CLI | Command-line interface. An interface comprised of various commands which are used to control operating system responses. |
| Cnt Ac-J | P9000 or XP Continuous Access Journal software. |
| Cnt Ac-J Z | The version of Continuous Access Journal that supports mainframe volumes. |
| Cnt Ac-S | P9000 or XP Continuous Access Synchronous software. |
| Cnt Ac-S Z | The version of Continuous Access Synchronous that supports mainframe volumes. |
| CU | Control Unit. Used to organize the storage space attached to the disk controller (DKC). You can group similarly configured logical devices (LDEVs) with unique control unit images (CUs). CUs are numbered sequentially. The disk array supports a certain number of CUs, depending on the disk array model. Each CU can manage multiple LDEVs; therefore, both the CU number and the LDEV number are required to identify an LDEV. |
| CVS | CVS devices (OPEN-x CVS or 3390-x CVS) are custom volumes configured using array management software to be smaller or larger than normal fixed-size OPEN or mainframe system volumes. Synonymous with volume size customization (VSC). OPEN-V is a CVS-based volume. |
| C-Track | Continuous Track. An HP software program that detects internal hardware component problems on an array and automatically reports them to HP Support Services. |
| DFSMS | Data Facility Storage Management Subsystem. |
| DKA | Disk adapter. |
| DKC | Disk controller. |
| DKU | Disk Unit. |
| emulation mode | <p>The LDEVs associated with each RAID group are assigned an emulation mode that makes them operate like OPEN system disk drives. The emulation mode determines the size of an LDEV or volume.</p> <p>OPEN-V: User-defined custom size</p> <p>3390-3/3R: 2.838 GB</p> <p>3390-9: 8.514 GB</p> <p>3390-L: 27.844 GB</p> |

3390-M: 55.689 GB

3380-3 2.377 GB

| | |
|---------------------------|--|
| ESW | Express switch adapter. |
| failover | The process that occurs when one device assumes the workload of a failed companion device. Failovers can be planned or unplanned. |
| FBA | Fixed-block architecture. |
| FC-AL | Fibre Channel Arbitrated Loop. |
| fence level | A method of setting rejection of P9000 or XP Continuous Access write I/O requests from the host according to the condition of mirroring consistency. |
| Fibre Channel | A data transfer architecture designed for mass storage devices and other peripheral devices that require high bandwidth. |
| Fibre Channel Loop | An enclosure that provides twelve-port central interconnect for Fibre Channel Arbitrated Loops following the ANSI Fibre Channel drive enclosure standard. |
| FICON | Fibre connectivity. An FC layer 4 protocol used to map mainframe channel command and data I/O operations onto standard FC infrastructure, protocol, and FC services. |
| HBA | Host bus adapter. |
| HCD | Hardware Configuration Definition. |
| HDD | Hard disk drive. |
| LDKC | Logical disk controller. |
| LUN | Logical unit number. A LUN results from mapping a logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. |
| LUSE | Logical Unit Size Expansion. The LUSE feature is available when the HP StorageWorks LUN Manager product is installed, and allows a LUN, normally associated with only a single LDEV, to be associated with 1 to 36 LDEVs. Essentially, LUSE makes it possible for applications to access a single large pool of storage. |
| M-VOL | Main volume. |
| MCU | Main control unit. |
| OPEN-x | A general term describing any of the supported OPEN emulation modes (for example, OPEN-E). There are two types of OPEN-x devices: legacy OPEN-x devices with a fixed size (such as OPEN-3, OPEN-8, OPEN-9, and OPEN-E), and OPEN-V, which has a variable size and is a CVS-based volume. |
| P-VOL | Primary volume. |
| parity group | A set of hard disk drives that have the same capacity and that are treated as one group. A parity group contains both user data and parity information, which enables user data to be accessed if one or more drives in the group is not available. |
| path | A path is created by associating a port, a target, and a LUN ID with one or more LDEVs. Also known as a <i>LUN</i> . |
| PAV | Parallel access volume. |
| PCB | Printed circuit board. |
| PDEV | Physical device. |
| PDP | Power Distribution Panels. |
| PDU | Power distribution unit. The rack device that distributes conditioned AC or DC power within a rack. |
| port | A physical connection that allows data to pass between a host and the disk array. The number of ports on a disk array depends on the number of supported I/O slots and the number of ports available per I/O adapter. The P9000 and XP family of disk arrays supports Fibre Channel (FC) ports and other port types. Ports are named by port group and port letter, such as CL1-A. CL1 is the group; A is the port letter. |

| | |
|---------------------------------|--|
| RAID group | A group of disks configured to provide enhanced redundancy, performance, or both. Specifically, four or eight physical hard disk drives (HDDs) installed in a P9000 or XP disk array and assigned a common RAID level. In an XP disk array this is also referred to as an <i>array group</i> or <i>parity group</i> . |
| RAID level | A configuration of disk drives that uses striping, mirroring, and parity to improve performance and data availability and reliability. |
| RAID Manager | The CLI configuration and replication tool for the P9000 or XP disk array that system administrators can use to enter RAID Manager commands from open-system hosts to perform Continuous Access, Business Copy, Database Validator, and Data Retention operations, as well as provisioning commands on logical devices. |
| RAID1-level data storage | A RAID that consists of at least two drives that use mirroring (100 percent duplication of the storage of data). There is no striping. Read performance is improved since either disk can be read at the same time. Write performance is the same as for single disk storage. |
| RAID1/5 | Specific RAID architectures. |
| RAID5-level data storage | A RAID that provides data striping at the byte level and also stripe error correction information. RAID5 configurations can tolerate one drive failure. Even with a failed drive, the data in a RAID5 volume can still be accessed normally. |
| RAID6-level data storage | A RAID that provides data striping at the byte level and also stripe error correction information. RAID6 configurations can tolerate two drive failures. Even with two failed drives, the data in a RAID6 volume can still be accessed normally. RAID6 read performance is similar to RAID5, since all drives can service read operations, but the write performance is lower than that of RAID5 because the parity data must be updated on multiple drives. |
| RCU | Remote control unit. |
| Remote Web Console | A browser-based program installed on the SVP that allows you to configure and manage the disk array. |
| RM | HP StorageWorks RAID Manager. |
| SAS | Serial Attached SCSI. |
| SCP | State-change-pending. |
| SIM | Service information message. |
| SMPL | Simplex. |
| SSB | Sense byte. |
| SSD | Solid state disk. A high-performance storage device that contains no moving parts. An SSD contains DRAM or EEPROM memory boards, a memory bus board, a CPU, and a battery card. |
| SSVPMN | Sub Service Processor Monitor. |
| SVP | Service processor. A computer built into a disk array. The SVP, used only by an HP service representative, provides a direct interface to the disk array. |
| synchronous | Describes computing models that perform tasks in chronological order without interruption. In synchronous replication, the source waits for data to be copied at the destination before acknowledging that it has been written at the source. |
| TID | Target ID. |
| UID | Unit identification. |
| V-VOL | Virtual Volume. |
| VOL, vol | Volume. |
| volume | Volume on disk. An accessible storage area on disk, either physical or virtual. |
| WLM | Workload manager. |
| WWN | World Wide Name. A unique identifier assigned to a Fibre Channel device. |

Index

A

architecture
system, 17

B

basic configuration;configuration
basic, 6
battery replacement notices, 96

C

cache, 54
Canadian notice, 86
capacity
cache, 10
disk drive, 10
chassis
controller, 54
controller, components, 54
drive, 57
components
controller chassis, 54
drive chassis, 57
configuration
maximum, 9
minimum, 9
contacting HP, 74
controller chassis, 7, 9
controller, components, 8, 54
controls
description, 56
system, 56
conventions
document, 75
storage capacity values, 75
text symbols, 76
cooling fans, 58

D

Declaration of Conformity, 86
Disposal of waste equipment, European Union, 91
document
conventions, 75
related information, 74
documentation
HP website, 74
providing feedback, 74
drive chassis components, 57

E

European Union notice, 86

F

fans
controller chassis, 55
cooling, 58

drive chassis, 59
features
hardware, 6
software, 13
Federal Communications Commission notice, 85

H

hardware description, 6
help
obtaining, 74
host modes, 51, 52
HP
subscription service, 74
technical support, 74
hub, 54

J

Japanese notices, 87

K

Korean notices, 87

L

laser compliance notices, 89
logical units, 20, 21

M

mainframe, 21, 22
memory
cache, 59
shared, 61
microprocessor, 54

N

new features, 6

O

operations
battery backup, 67
option modes
system, 22

P

power supply, 55
procedures
power off, 67
power on, 66

R

rack stability
warning, 76
RAID groups, 17
RAID implementation, 17
recycling notices, 91
regulatory compliance
Canadian notice, 86

- European Union notice, 86
- identification numbers, 85
- Japanese notices, 87
- Korean notices, 87
- laser, 89
- recycling notices, 91
- Taiwanese notices, 88
- related documentation, 74

S

- safety, 66
- service processor, 54
- specifications
 - drive, 10, 13
 - electrical, 80
 - environmental, 83
 - general, 12
 - mechanical, 80
- storage capacity values
 - conventions, 75
- subscription service, HP, 74
- SVP, 54
- switches
 - control, 56
 - ESW, 54
 - power, 67
- symbols in text, 76
- system reliability, 6

T

- Taiwanese notices, 88
- technical support
 - HP, 74
 - service locator website, 74
- technological advances, 6
- text symbols, 76
- typographic conventions, 75

V

- virtualization, 6

W

- warning
 - rack stability, 76
- web sites
 - HP subscription service, 74
- websites
 - HP, 74
 - product manuals, 74